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CITY COUNTY STATE

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Rebuilding Broadway in Gary

The principal business street of this Indiana city resurfaced over an old pavement eighteen years old with as little interference as possible with traffic and business.

By W. P. Cottingham*

The salvage value of an old concrete pavement was preserved last year in Gary Indiana, by resurfacing Broadway, the principal business street, with sheet asphalt. In this operation, a concrete pavement constructed under the Blome-Sinek patents in 1907 and 1908, and over which the building materials to build this city have been transported, was redeemed as a satisfactory foundation for a new wearing surface. The old surface was badly cracked and the property owners demanded a new pavement because they objected mostly to the appearance of the old one. An important incidental item was the opportunity given under the special assessment procedure to construct a new lighting system and remove the trolley poles from the center of the street.

The street railway company in 1924 opened the way for the resurfacing by reconstructing their double track line on Broadway and re-establishing their original grade. Apparently the entire street width had settled somewhat uniformly and consequently the car track area as reconstructed was found to be somewhat above the old pavement. In general the difference in grade was sufficient to accommodate a 3" wearing surface. The readjustment in the tracks of the street car lines anticipated the removal of the center trolley poles and the distance between track centers was reduced from 13' to 10' 6". The entire car track area was constructed of concrete pavement, leaving the space between the outer rail and the edge of the old concrete pavement to be paved with brick temporarily to take up the difference in grade.

Early in 1925 the property owners on Broadway petitioned the city for the improvement of the street by paving and lighting the business district. Plans were prepared and after the necessary proceedings and public hearings, bids were received on June 29th. Alternate propositions were submitted on sheet asphalt resurfacing and on a new concrete pavement.

*City engineer of Gary, Ind.

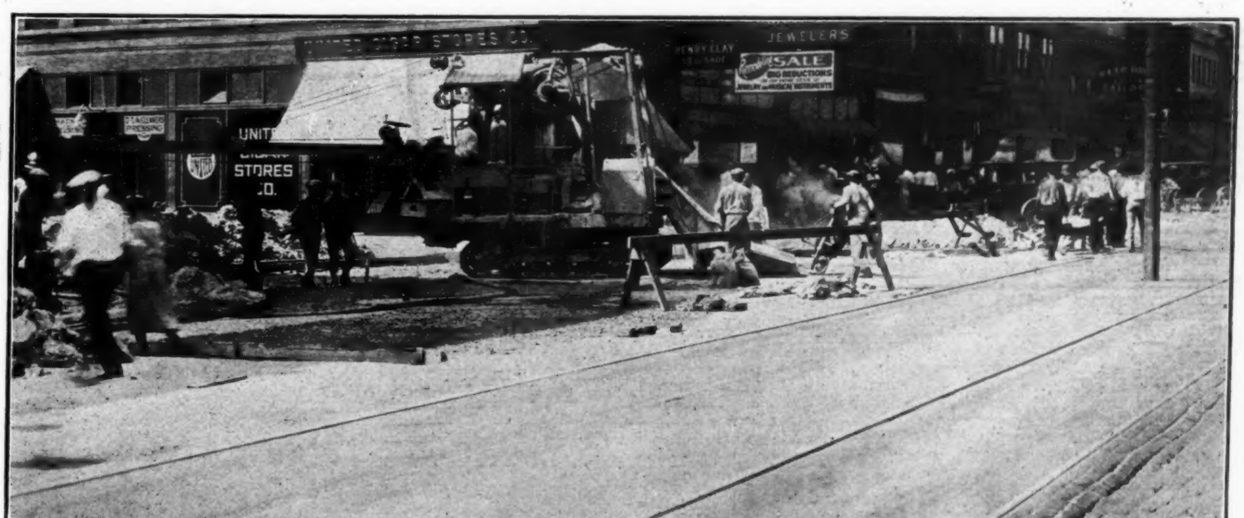


FIG. 1. CONSTRUCTING NEW BASE FOR SHEET ASPHALT SURFACE.
Including widening approaching pavement and increasing curb radius; also eliminating raised cross-walks.

The resurfacing job was bid in at a saving of $26,100.88 as may be seen from the accompanying tabulation.

TABULATION OF BIDS FOR REBUILDING BROADWAY, GARY, INDIANA, JUNE 29, 1925

	Items	Mun. Cont. & Sup. Co. Price	Mun. Cont. & Sup. Co. Total	Sunderman Cons. Co. Price	Sunderman Cons. Co. Total	M. D. Heiny Price	M. D. Heiny Total
[1]12963.0	Sq. Yds. Sheet Asphalt Pavement on Present Pave. (using Trinidad Asphalt)					$1.85	$23,981.55
[2]12963.0	Sq. Yds. Sheet Asphalt Pavement on Present Pave. (using Texico Asphalt)					1.80	23,333.40
[3]12963.0	Sq. Yds. Sheet Asphalt Pavement on Present Pave. (using Mexican Asphalt)					1.80	23,333.40
[4]12963.0	Sq. Yds. Sheet Asphalt Pavement on Present Pave. (using Any Std. Brand Asph.)	$2.00	$25,926.00				
[5]12963.0	Sq. Yds. 9" One Course Reinforced Concrete Pavement			$3.60	$46,666.80	3.75	48,611.25
4781.3	Lin. Ft. Combined Curb and Gutter Removed and Replaced	2.00	9,562.60	1.60	7,650.08	2.00	9,562.60
540.0	Sq. Yds. Street Railway Concrete Marginal Strip (Including Grading)	3.50	1,890.00	4.25	2,295.00	3.50	1,890.00
12963.0	Sq. Yds. Grading (Includes old Pavement Removed)			1.00	12,963.00	1.00	12,963.00
1002.4	Sq. Yds. 7" Concrete Base (Including Grading)	3.25	3,257.80			2.50	2,506.00
80.0	Lin Ft. 6 Duct Fiber Conduit	3.00	240.00	4.50	360.00	300.00	24,000.00
400.0	Lin. Ft. 2" Steel Pipe Conduit	1.00	400.00	2.50	1,000.00	100.00	40,000.00
2500.0	Lin. Ft. 4 Duct Combination Fibre Conduit	2.50	6,250.00	3.50	8,750.00	230.00	575,000.00
325.0	Lin. Ft. 10" Catch Basin Connection	3.00	975.00	2.00	650.00	2.75	893.75
650.0	Tons Extra Binder	10.00	6,500.00			9.50	6,175.00
11	Catch Basin and Gutter Inlet Covers Reset	3.00	33.00	5.00	55.00	3.00	33.00
3	Catch Basins (New)	100.00	300.00	100.00	300.00	90.00	270.00
536.0	Sq. Yds. Sidewalk Removed and Replaced	4.00	2,144.00	2.65	1,420.40	3.30	1,768.80
12	Ornamental Light Poles Reset	35.00	420.00	12.00	144.00	35.00	420.00
2700.0	Lin. Ft. 2 Duct Fibre Conduit	1.25	3,375.00	2.00	5,400.00	150.00*	405,000.00
49	Manholes—28"x32"x4'	95.00	4,655.00	90.00	4,410.00	90.00	4,410.00
1	Manhole—4'x4'x6'	135.00	135.00	100.00	100.00	125.00	125.00
	Grand total, based on Item 1						$1,096,035.70
	Grand total, based on Item 2						1,095,387.55
	Grand total, based on Item 3						1,095,387.55
	Grand total, based on Item 4		66,063.40				
	Grand total, based on Item 5				92,164.28		1,124,947.40
	To be completed		October 15, 1925		November 1, 1925		September 20, 1925

*This is obviously a mistake on the bidder's part.

The contract was awarded to the Municipal Contracting & Supply Company for sheet asphalt resurfacing and work started early in August. Many miscellaneous items were included in the contract, such as the rebuilding of the curbs and gutters and the installation of the conduits for the future lighting system.

A readjustment of the gutter was necessary to secure an edge for the new wearing surface. A marginal strip of concrete was required along the outer rails of the car track area for the same purpose. In constructing both curb and gutter and the marginal strip, calcium chloride was used in the concrete mixture to accelerate the hardening and permit the early use of both parts for completion of the project. At intersecting streets where the old cross walks had been raised and where short-radius curbs existed, the entire intersection was torn out and rebuilt with widened cross street widths,

FIG. 2. PARKING ON BINDER DURING CONSTRUCTION.
Concrete marginal strip along car track; binder as base in space next to marginal strip.

increased curb radius and with uniform surface cross-section in each direction. Picture No. 1 shows this work in progress. In this concrete, as in the gutters, calcium chloride was used to give early use of the streets.

The conduit lines for the lighting system and for police and fire alarm systems were installed in the sidewalk area, placing a two-duct line on one side and a four-duct line opposite. Manholes were constructed at points adjacent to pole locations. Ample provision was made for looping circuits by shoving pipe conduits across the street. Provision was also made for traffic control signals at all intersections.

Upon completion of the preliminary operations, the street was cleared of all material and thoroughly swept by hand with wire street brooms. The entire surface of old pavement was then gone over with a spiking crew using a pneumatic drill to chip out a small portion of surface to provide anchorage for the wearing surface. This roughening process amounted to an attempt to break up the smoothness of the old worn slab to such an extent that no smooth area of over four square feet was unbroken by chipping. This work was then cleaned up carefully and a paint coat of asphalt, cut back with gasoline, was applied to the entire surface at least six hours in advance of the binder course.

The sheet asphalt surface consisted of a binder course 1½" in thickness and a top course of the same thickness. All depressions and irregularities were taken up in the binder course and the extra binder so used was paid for at the bid price per ton of binder. The difference in each day's run of binder between the amount required for the uniform thickness of 1½" and the total run was the amount paid for as extra binder. One hundred fifty (150) pounds per square yard was agreed upon as the amount required for the uniform thickness.

The asphalt contractor worked double shift on the laying of the pavement. Binder was run the entire first day and during the night the plant turned over to top. From then on the plant would run out surface mixture until the previous day's binder run was covered, and then go on to binder, running binder until midnight. The entire contract was completed sixty days after commencing operations.

At all times the contractor was required to accommodate traffic on the street whenever possible. Parking was permitted on the binder course when this did not interfere with his operation. Figure No. 2 indicates the extent to which this permission was used. The same view shows the one side of the street completed, shows the manner in which the narrow space between the contract marginal strip and the old pavement was filled with binder for use as an asphaltic concrete base, and shows the chipping marks and the old cracks in the old concrete surface. The edge of the new gutter is to be noted at the right of the picture. Picture No. 3 shows more in detail the preparation of the base by chipping and the trench along the gutter for the forms, which trench was filled with concrete when the forms were pulled.

It may be interesting to note that the center trolley poles have been removed since the completion of this paving project and the trolley wires are now carried by span wires from combination trolley and lighting standards on the curbs.

Work on the paving project by the Municipal Contracting & Supply Company of Gary was under contract with the Board of Public Works of the City of Gary. Preparation of plans and specifications and supervision and inspection of the work were directed by the city engineer of Gary, assisted by Isaac VanTrump, asphalt chemist, of Chicago.

The Lincoln Highway

It is reported that over $9,000,000 was spent on the Lincoln Highway last year, and that only 34 miles of the route is still natural earth and 333 miles graded earth. Of the improved portions, 1,382 miles are graded gravel, 559 miles are concrete, 449 are macadam, 117 brick, 33 natural gravel, and 11 asphalt. The remaining 224 miles of the total 3,142 consists of paved city streets.

Nevada, with the smallest population of any state in the Union, spent $1,125,000 in Lincoln Highway construction and $51,200 in maintenance.

FIG. 3. BASE PREPARED FOR WEARING SURFACE.
Surface roughened by chipping. Trench along gutter to receive forms.

Stream Pollution and Natural Purification

Investigation of the subject by the U. S. Public Health Service. Rate of deoxygenation of polluted water and atmospheric reaeration. Bacterial pollution and natural purification of certain rivers

A symposium on the subject of stream pollution was the feature of a meeting in 1925 of the Sanitary Engineering Division of the American Society of Civil Engineers. A paper was presented by W. H. Frost, surgeon with the U. S. Public Health Service, giving a review of the works of that bureau in investigations of stream pollution; one by Emery J. Theriault, associate chemist with the U. S. Public Health Service, discussing the rate of deoxygenation of polluted waters; one by H. W. Streeter, sanitary engineer with the Service, discussing the rate of atmospheric reaeration of sewage polluted streams; and a fourth by J. K. Hoskins, sanitary engineer with the Service, discussing quantitative studies of bacterial pollution and natural purification in the Ohio and Illinois rivers.

In the first paper Mr. Frost reviewed briefly the investigations made by the service to date, beginning with A. J. McLaughlin's survey of the cities of the Great Lakes in 1910; special attention being paid to the intensive study of stream pollution begun in 1913, interrupted during the war, and resumed in 1919.

Since 1919, the principal field investigations have been:

1.—A study of the pollution and natural purification of the Illinois River, undertaken chiefly to check and extend observations previously made on the Potomac and the Ohio rivers relative to the laws governing natural purification in streams.

2.—A survey of representative municipal sewage disposal plants in various parts of the United States, to collect information as to their efficiency and cost in actual operation.

3.—A collective study of municipal water purification plants, chiefly rapid sand filters, as operated in a number of cities on the Ohio river and elsewhere, with a special view to ascertaining more precisely the relations between pollution of the raw water and quality of the effluent under varying processes and conditions of operation.

Results of these investigations have been published from time to time in bulletins of the Public Health Service.

The other papers discuss at some length certain features of a large number of data obtained by the investigations. Only the summaries or conclusions are given below.

Concerning the biochemical oxygen demand test, discussed by Mr. Theriault, he says:

"It is significant both of the intrinsic merit of the biochemical oxygen demand test and, it must be admitted, of the numerous difficulties which arise in its practical application, that, in a recent bibliographical review, no less than 150 references were found which dealt directly with the subject. The consensus of opinion apears to be that the test is valuable. In fact, for the purposes of stream pollution studies, it is frequently the only chemical procedure which can be used to advantage. As a measure of the relative strength of various organic wastes and as a guide in estimating the efficiency of particular methods of treatment, the test also appears to possess decided advantages over the usual chemical procedures."

As a result of his study of the data available, he reached the following conclusions:

"1.—The Phelps formula holds with reasonable accuracy when applied to samples recently polluted with organic matter." (This formula may be expressed by the equation $X = L\ (1\text{-}10^{-kt})$ in which X is the oxygen absorbed in t days, L is the oxygen absorbed during the carbon-oxidation stage, and K is a constant at a given temperature.)

"2.—For periods of incubation of less than ten days, it is possible to refer the results obtained under standardized laboratory conditions to the actual times of flow and temperatures of a stream.

"3.—Under aerobic conditions, the stabilization of organic matter apparently proceeds in two distinct stages.

"4.—The rate at which a polluted water is deoxygenated depends largely on the condition of the sample with respect to its state of oxidation.

"5.—It is necessary to exercise considerable caution in interpreting the results of analyses when the nitrification stage has almost been reached.

"6.—Absolute values for the purification accomplished by a treatment plant cannot be obtained without resorting to protracted incubation.

"7—A complete solution of the problem probably depends on the development of methods whereby the state of oxidation of a sample may be determined more readily."

Mr. Streeter, as the result of an analytical study of the data relative to atmospheric reaeration, derived the following equation:

$$D = \frac{K_1 L_a}{K_2 - K_1}\left(10^{-K_1 t} - 10^{-K_2 t}\right) + D_a \times 10^{-K_2 t} \quad \text{.........(5)}$$

in which,

D_a = the initial dissolved oxygen saturation deficit, in terms of concentration;

D = the dissolved oxygen deficit after time, t, in similar terms;

L_a = the initial biochemical oxygen demand;

K_1 = the coefficient of deoxygenation; and

K_2 = the coefficient of reaeration.

He believed that the following tentative conclusions were justified:

"1.—The reaeration of flowing streams proceeds substantially in accordance with physical laws which have already been described.

"2.—Its rate at any time is controlled mainly by the temperature, turbulence, and oxygen saturation deficit of the stream.

"3.—The empirical method of measuring rates of reaeration which has been described, involving the use of the resultant oxygen Equation (5) and the substitution therein of quantities derived by observations in the stream made under proper circumstances, gives results which appear to be consistent with known facts concerning the physical conditions influencing such rates.

"4.—By a proper combination of predetermined rates of reoxygenation and of reaeration, using Equation (5), a reasonably accurate calculation may be made of the resultant progressive changes in the dissolved oxygen content of a stream under any given or assumed condition of flow, temperature, and initial degree of pollution.

"The studies of stream reaeration thus far made along lines indicated in this paper have been confined to the Ohio and Illinois rivers, surveys of which have offered the only sufficiently extensive and properly co-ordinated data thus far available for this purpose. A much more comprehensive analysis of the Illinois River data, as yet to be completed, probably will give a more satisfactory basis for judgment as to the wider applicability of the results of these studies than it has been practicable to establish within the limited scope of this paper. Some features of the present theory of stream reaeration and its method of application doubtless will require further modification as more experience is gained in testing it against specific problems. The studies thus far completed, however, have indicated that the theory in question, applied with due consideration to its practical limitations, offers a working hypothesis for a more rational treatment of stream sanitation problems involving the prevention of conditions contributing to nuisance and to the destruction of fish life in streams than hitherto has been available."

Mr. Hoskins reported on studies of the intensity of bacterial pollution from known populations discharging sewage into streams of known discharge and velocity of flow; these studies having been made on the Ohio river over a period of three years and on the Illinois river for one complete year. He found that in summer an average of 428 billion B. coli per day were discharged into streams by Chicago, 231 by Peoria, 583 by Cincinnati and 291 by Louisville, averaging 383 billion; while in winter the figures were 42, 141, 119, 193 and 124 billion, respectively. The numbers varied quite uniformly by months, B. coli increasing from a minimum average of 26 per cent of the annual average in January to 222 per cent in June. The numbers also decreased with distance below the source of supply. For example, on the Ohio river, during the summer season, 2,280 B. coli per c.c. at the point of maximum concentration decreased to 1,459 in 10 hours flow, to 934 in 20 hours, 599 in 30 hours, 385 in 40 hours, down to 4 in 200 hours.

A general summary of his discussion is as follows:

"Quite extended observations of the pollution of Illinois and Ohio Rivers have indicated that the numbers of bacteria contributed per capita by the sewered populations of various cities are reasonably constant; these numbers change, however, with seasonal temperature, being much greater in summer than in winter. Such bacteria tend to increase in numbers in the receiving stream for a short period and then decrease at orderly rates as the time from the point of maximum density is increased. These rates of decrease were found to be affected by water temperature and apparently by concentration, being most intensive during the warmer months and under conditions where the density of bacteria was greatest.

"Having established definite quantitative relationships from these observations, and assuming that they are fairly representative of stream conditions in general, a method is suggested for estimating the maximum concentration of B. coli in streams of known volume of flow that may be expected to result from pollution contributed by known sewered populations. Furthermore, the concentration of such organisms remaining at any point down stream may be estimated, providing the velocity of flow is ascertained.

"If the observations are representative of general biological laws, they are of practical value for estimating the increasing burden placed on streams receiving the sewage of growing communities and, consequently, the added loads that water-purification plants must be prepared to handle where such polluted watercourses are used as sources of water supply."

Outfall Sewer for Lynn, Massachusetts

The city of Lynn, Massachusetts, has for a number of years been considering the construction of an outfall sewer to prevent the pollution of Lynn Harbor by the discharge of sewage along the waterfront. Definite action was finally taken last year when the city made arrangements to borrow one and one-half million dollars for the purpose of carrying out the plans of its consulting engineers, Morris Knowles Inc. of Pittsburgh, Pa. The outfall sewer will be about three miles long, a large part of it laid under the water of the harbor, where the outlet end reaches a depth of 35 feet at low water, where a crib will be built. Some rock excavation will be necessary. A large part of the sewer will be laid on saddles supported by piles which probably will range from 25 feet to 100 feet in length. At one point the outlet passes under the Federal channel, which has a width of about 300 feet. It will be necessary to pump the sewage, the pumping capacity provided being 90 m.g. in 24 hours.

The contracts for the work were awarded as follows: For soundings and borings, B. F. Smith,

Inc. $9,562. For installing sewage pumping equipment (electric equipment by the General Electric Co. will be employed), Stackweather & Broadhurst of Boston, $106,401. Furnishing 60-inch cast iron pipe, Eugene E. Burnham of Lawrence, $430,908. For laying the pipe, Merritt-Chapman & Scott of Bridgeport, $494,950. The contract for the pumping station building has not yet been awarded.

Delivery of the pipe is to be completed by April 30th, being brought to Lynn by rail and placed by derrick on floats, by which they will be taken to the point where the laying is in progress. Laying the outlet will not begin until the ice is out of the harbor-probably the latter part of February or the first of March.

Street Lighting in Davis Islands

The developers and owners of the Davis Islands in Tampa Bay, about one-half-mile from Tampa's city hall, have prepared a complete lighting system which covers the entire area. They have recently awarded a contract for the complete installation of this system to the Westinghouse Electric and Manufacturing Company. The system will contain 1,500 complete lighting units, making what is perhaps the most uniform street lighting system in the country.

Standards will be "hollowspun" concrete of Sheridan design, resembling stone in appearance. The lighting units will be Westinghouse octagonal with bronze or aluminum lanterns. For the residential section, these lanterns will be all metal to confine the light to the ground, but along two of the avenues glass panels will be used in the canopy. The standards will be 17 feet high along the boulevards and 14 feet in other places. In the business section, the standards will be so spaced as to produce a "white-way" effect. The larger units will be illuminated by Mazda series lamps of 6,000 lumen capacity, while in the residential sections they will be 4,000 lumen.

LIGHTING STANDARD, DAVIS ISLANDS.

The installation of these 1,500 units will require more than 55 miles of cable. The cable will be laid at a depth of 12 inches alongside the curb.

Responsibility for Injury to Garbage Collector

The following abstract of a decision of the Arizona Court is found in the Public Health Reports of the U. S. Public Health Service for January 29.

Collection of garbage by city held to be governmental function and damages denied injured municipal employee.—(Arizona Supreme Court; decided October 17, 1925) The plaintiff was employed by the defendant, the city of Phoenix, in loading and unloading an auto truck used by the city in the collection of garbage. While the truck was hauling garbage, the driver, another city employee, lost control of the machine, due to running at excessive speed and to defective brakes and steering gear. The plaintiff, riding on the truck, was seriously injured in jumping from the truck when the same was about to run into a deep canal. A demurrer, filed on the ground that the city was operating the truck in the exercise of a governmental function, was upheld by the lower court, and the plaintiff appealed. The supreme court affirmed the judgment, the following being a portion of the opinion:

The courts have, therefore, from an early time held that, when acting in its governmental capacity, it had the exemptions of the sovereignty, but while for its quasi private benefit it was subject to the liabilities of an individual. This rule is of such almost universal acceptance in the jurisdictions which have adopted the theory of the exemption of the State that we accept it as the undoubted law of Arizona. The authorities are so united on this point that no extensive citations are necessary. 28 C. J. 1527. 1528, and note.

When, however, we come to the application of the rule, we find the utmost confusion as to where and how the line of demarcation should be drawn. We therefore consider the cases involving negligence occurring in work like that in which plaintiff in this case was engaged, viz., the sanitary service of the city. Almost without exception these hold that such work is governmental in its nature and that the municipality is not liable. (Jones *v.* City of Phoenix, 239 Pac. 1030).

Sterilizing Water Mains

At the meeting last fall of the North Carolina section of the American Water Works Association, considerable discussion was given to the subject of sterilizing water mains after they have been laid, which subject was introduced by C. W. Absher, superintendent of water purification with the water and light department of Mr. Airy, N. C.

Mr. Absher stated that considerable time should elapse after liquid chlorine is applied to the new main before it is put into service, and suggests that advantage be taken of the retention of water in the main to test it for tightness after each day's laying. This can be done by means of a detachable test plug and rubber gasket for closing the end of the pipe, this plug containing a short nipple and stop cock for allowing the escape of air. The tank of chlorine can be connected to the main just beyond the point where the new work started by means of an ordinary corporation cock. The water and chlorine can be introduced simultaneously, the chlorine connection being left on until the orthotoluidine test shows complete sterilization, the water for the test being taken from the orifice in the plug.

In discussing this paper, there seemed to be

great unanimity of opinion as to the desirability of sterilizing mains both when they were new and when a break or other opening of the main had permitted polluted water to enter it; and almost equal unanimity in stating that the cities from which the speakers came did nothing of the kind. An exception to the latter was cited by Geo. F. Catlett, sanitary engineer of the North Carolina State Board of Health, in connection with Ashville, where an emergency filter plant was started recently and it was considered very necessary that mains, pump and filter boxes should be thoroughly sterilized. In sterilizing the pump, a piece of tubing was carried from the tank of chlorine down the suction well close to the suction, and chlorine was run in until it could be smelled at the blow-off. The pump was then shut down and the water allowed to stay in it for 10 minutes. The mains and filter boxes also were sterilized by means of chlorinated water. In reply to a question from one of the members, Mr. Catlett stated that there is generally a slight phenol taste in water drawn through new mains for a short time after the chlorine has been applied.

Electrically Operated Power Shovels

In a review of developments in the use of electricity made during the year 1925, John Liston, of the General Electric Co., referred to several appliances used in contract work; among them power shovels, of which he has the following to say:

"There has been a growing tendency during the past six years for power-shovel manufacturers to design their electrically operated shovels primarily for the application of electrical apparatus. Prior to that time, most electric shovels were merely adaptations of existing steam-shovel designs. This tendency has greatly simplified the problem of providing suitable electrical equipment and its growth is indicated by the fact that, at the beginning of this period, only about 5 per cent of all shovels built were electrified, whereas in 1925 the proportion had risen to about 40 per cent of the total.

"Practically all sizes of shovels have been successfully electrified, from the ¾-cu. yd. size used for small excavation jobs (Fig. 1) to the enormous outfits used in surface mining (Fig. 2), which carry booms up to 90 ft. in length with dippers up to 10 cu. yd. in capacity.

"A shunt-wound motor was adopted which made the operation of the shovel simpler and permitted the operators to use the motors as brakes. It was also possible to do away with practically all contactors or similar devices so that the shunt-motor-equipped shovels of today do not require controlling contactors.

"The generators can be directly connected with the motors and the speed and direction of rotation controlled by the field of the generator, which in turn passes through a small master controller.

"In a number of cases where electric service was not available, gasoline-electric shovels have been used, utilizing a gasoline-engine-driven generator for supplying current to the various motors."

Reservoirs and Malaria

Opinion expressed by engineer of U. S. Public Health Service that creation of reservoirs may increase prevalence of anopheles. Precautions recommended for preventing this.

The creation of new water works reservoirs or similar artificial bodies of water, or increasing the size of existing ones, "may increase to a marked extent the prevalence of the malaria conveying mosquito (the anopheles) in territory adjacent to the new or enlarged lake that may affect the malaria sick rate in families living within a mile of the flow line of the lake."

This is the opinion of J. A. LePrince, sanitary engineer of the United States Public Health Service, as stated in a paper before the North Carolina section of the American Waterworks Association. "In some instances," said Mr. LePrince, "proper precautions are not taken because engineers do not realize fully what conditions are favorable to the maximum production of malaria conveying mosquitoes."

As a general rule, conditions in a newly formed lake are most favorable to mosquito production during the first three years, and especially when water is impounded during June, July and August. Floating vegetation is often found in new reservoirs which affords protection to anopheles, while at the same time the natural enemies of

FIG. 1. ELECTRICAL SHOVEL, ¾-YARD SIZE.

FIG. 2. ELECTRICAL SHOVEL WITH 10-YARD DIPPER.

the larvae have not yet developed in abundance. It was suggested that it would be desirable to supply an abundance of mosquito-destroying minnows, such as the gambusia, which is especially effective in southern waters. To make this possible, it is advisable to establish hatcheries of these fish so as to have a large number of them available as soon as the reservoir is filled.

"The United States Public Health Service has been studying the relation of impounded waters to malaria outbreaks and malaria prevalence for a number of years. In Alabama, South Carolina, and Virginia the state health department regulations for the impounding of water are based on these studies.

"In 1917, the Conference of State and Territorial Health Authorities discussed the advisability of having legislation enacted, which would permit the impounding of water on a large scale only after a license was obtained from state health authorities, which would prescribe certain conditions to minimize or prevent the danger of spread of malaria, and later the Public Health Service took this matter up again with the state health departments.

"A brief outline of regulations is given below.

OUTLINE OF REGULATIONS FOR IMPOUNDED WATERS

"1. Wherever impounded water projects are to be located under the provisions of this act in those parts of the United States in which malarial fevers exist, or malaria bearing mosquitoes are known to propagate, the following general measures shall be enforced for the protection of the public health:

"(*a*) All laborers employed in the construction of the dam and the impounding of the water, shall be housed in properly screened houses and such steps taken by quinine administration and control of mosquito production in the vicinity of the camps as may be necessary to prevent the infection of malaria mosquitoes and the introduction of malaria into this locality.

"(*b*) In the area to be occupied by the reservoir, its branches and indentations, all brush, trees, undergrowth, logs and similar objects, which if not removed would float on the surface of the impounded water and thus constitute conditions favorable to the production of malaria mosquitoes, shall be removed, burned or otherwise disposed of prior to the closing of the dam and impounding of the water. All trees or underbrush shall be cut sufficiently near to the surface of the ground to prevent their standing above the surface of the water at any and all stages of the water, and thus holding drift and floatage.

"(*c*) The formation of log jams and the collection of drift and floatage in narrow valleys or indentations and along the banks of the reservoir where wave action is absent or weak, shall be prevented during the mosquito season.

"(*d*) Insofar as practicable, the water level in the reservoir shall be fixed so as to reduce to a mimimum shallow, submerged areas on which aquatic plants will grow and reach the surface of the water.

"(*e*) When practical the water level in the reservoir shall be held about three feet above normal high water level from December until the Anopheles breeding season in spring or early summer. After that time fluctuation is desirable.

"On gently sloping banks or where stranding of floatage is practical, before the water is impounded the shore line shall be cleared of all undergrowth, brush, trees and logs, to facilitate the stranding of floatage, for a distance of about fifteen feet back from normal high water level.

"During the first three years of the lake, its owners shall arrange for its constant inspection during the mosquito breeding season, and all sources of mosquito production shall be promptly eliminated or treated with larvicide.

"(*f*) The reservoir shall be adequately stocked with top minnows which feed upon mosquito larvae and every effort shall be made to protect them against their enemies and secure their successful propagation.

"(*g*) All separate pools and seepage places created during the construction of the dam or by the impounding of the water, whether adjacent to the reservoir or situated in the stream bed below the dam, shall be filled ditched, oiled, or stocked with top minnows (gambusia) in order to prevent mosquito production.

"2. Whenever an impounded water project is to be located under the provisions of the Act aforesaid, the licensee shall obtain a permit from the State Board oi Health and carry out such measures as the State Board of Health may determine to be necessary to prevent pollution of the drainage shed, or likely to cause or aggravate danger to the health of persons living near the lake.

"3. The foregoing rules may be amended from time to time as necessary within the discretion of the State Board of Health."

SUMMARY

"1. It is not good engineering practice to endanger the health of rural population in our efforts to improve the health status of the urban population.

"2. In impounded water projects the cost of removal of floating, aquatic growth, clearing of inlets, inspection for collections of floatage, start of growths of cattail and other aquatic plants, and Anopheles elimination, should be included in the original plan and estimate.

"3. In areas previously nonmalarial, though Anopheles were present, an epidemic can be created by the importation of malaria infected labor, and malaria prevalence can extend far beyond the flight range of Anopheles from the lake.

"4. A high water level in the winter months will often reduce cost of removal of floatage and will reduce mosquito production.

"5. Wherever possible Gambusia hatcheries should be established two summer seasons before water is impounded.

"6. Provision should be made for constant periodical inspection of newly formed lakes. The inspector must know or learn habits of Anopheles larvae and be interested in their elimination. He should keep all floatage treated with oil or larvicide until it can be removed, and leave no places (where mosquito larvae are present) untreated.

"7. The engineering division of our hydroelectric power companies have found the above to be good engineering practice and that its neglect is decidedly expensive procedure.

"8. Bulletins and reprints on the relation of impounded water to malaria and relative to control procedure have been published by the United States Public Health Service, Washington, D. C. and may be had on request.

Responsibility for Death from Polluted Water

The following abstract of a decision of the Washington Supreme Court is found in the Public Health Reports of the U. S. Public Health Service for January 29.

City held for deaths caused by drinking polluted water furnished by it.—(Washington Supreme Court; decided October 13 and October 16, 1925). Two separate actions, each involving practically the same state of facts, were brought against the city of Everett to recover damages for deaths alleged to have been caused by drinking polluted water furnished by the city. The pollution was apparently due to contaminated river water reaching the city water through a by-pass in a mill company's plant. In both cases the verdicts were against the city on the ground of negligence, and the judgments rendered upon the verdicts were affirmed by the supreme court. (Roscoe *v.* City of Everett, 239 Pac. 831; Aronson *v.* City of Everett, 239 Pac. 1011).

Snow Loading Machinery

The most noticeable feature of the removal of snow from New York streets after the two heavy falls early in February was the use of machinery rather than hand labor for filling the trucks. At one time at least four different makes of loaders were operating within a few blocks of this office.

As in former years, plows pushed by trucks and tractors were used to push the snow toward the gutters, leaving it in windrows or continuous piles three to six feet high. A loader was then started at one end of a pile and ate its way down the street, loading the snow into trucks. Most of the loaders seemed to be idle about half the time waiting for trucks, probably because these were delayed by traffic jams.

Two types of loaders were observed, one of the endless chain type, which loaded into a truck drawn up to the curb immediately behind it; the other a crane using a special kind of bucket, mounted on the rear of a truck, which loaded into a truck drawn up alongside it. The former offered no more interference with traffic than did the pile of snow it was removing. All were gasoline operated.

The truck bodies used with these loaders were quite large—about 11.2 feet long, 6 ft. to 6.3 ft. wide, and about 3.5 feet to the top of the side extensions. They were heaped up with all the snow they could carry which was probably about 10 to 12 cubic yards as placed in the truck. This compacted somewhat during transportation; on the other hand, it was already much more dense than when freshly fallen because of the pressure exerted by the plow in forcing it to the side of the street and because much of it had been compacted by traffic before being removed by the plows.

A Barber-Greene loader was timed and found to load this ten or twelve yards into a truck in 2½ to 3 minutes, or at the rate of 4 cu. yds. of compacted snow a minute. About a half-minute was required for a loaded truck to move away and an empty to take its place. If trucks were always ready, it could apparently load about 200 cu. yds. an hour. The crane and bucket loader seemed to require about four minutes to a load, but no time for substitution of empty for loaded truck. Each of the loaders used, in addition to the operator, two men shoveling up the edges of the piles left by the loader and otherwise cleaning up the street and feeding the loader.

Brick Shipments in December

The National Paving Brick Manufacturers Assoc., reporting the amount of brick shipped dur- sociation, reporting the amount of brick shipped during December by 26 of the leading manufacturers, gives figures showing that nearly seven million No. 1 paving brick were sent to fifteen different states, in addition to a little over two million of No. 2 and off-grade paving brick. Of the No. 1 paving brick, Ohio leads with 2,541,000, while Texas received 1,092,000, Florida 821,000, Pennsylvania, 786,000 and Illinois, 732,000. No other state received as many as 250,000.

In only two states were brick delivered for country highways, these being Ohio with 224,000, and Missouri with 124,000.

Unfilled orders for No. 1 paving brick on the last day of December totalled 30,820,000 of which about 20 million was intended for city streets. Of these unfilled orders, Ohio had the largest amount—14,430,000 and Texas next with 7,013,000; Illinois had 3,203,000, Pennsylvania, 1,905,000, and Kansas 1,850,000. In no other state did the unfilled orders reach one million.

UNIVERSAL CRANE AND OWEN SNOW BUCKET FILLING A 9 CUBIC YARD BODY ON A MACK TRUCK.

BARBER-GREENE CO. LOADER FILLING A 9 CUBIC YARD BODY IN 2½ MINUTES.

Thin Brick Pavements

Data from fifteen cities that have laid 2½ inch brick and from more than one hundred others with brick less than 4 inches thick. Special reports concerning thin pavements ten or more years old.

One of the inquiries sent out in our paving questionnaire, replies to which are published in one of the tables of this issue, asked the area, thickness and age of any brick pavements in service in the city that were less than 4 inches thick. On receiving the replies, we wrote to the informants in those cities where such pavements had been in use for more than six or eight years, with a view to learning what success had attended the use of thin brick pavements in those cities and under what conditions. Both the original questions and the collecting of the additional information were suggested by the inquiry being carried on by the Bureau of Public Roads into the history of thin brick pavements with a view to determining whether it is advisable to lay them in the future. Up to date we have received replies from which we quote or abstract the contents as given below.

Geneva, New York. Superintendent of streets and city engineer J. W. Brennan, writes that in 1916 a residential street carrying medium traffic was laid with 3-inch Bessemer wire-cut-lug brick on a 5-inch foundation of 1-2½-5 concrete with 1 inch of 1-3 cement-sand cushion. The foundation was allowed to cure before the cushion was placed. "The cushion was mixed in a mixer operated on the concrete base and was spread and made smooth with a templet and sprinkled just prior to the laying of the brick. The brick were rolled with a 5-ton tandem roller, sorted and culled, sprinkled, and grouted with a 1-1 grout. The work of grouting was completed each day so that there were left ungrouted at the end of the day but a few courses.

"The same type of construction was used on Genesee street, which is located in the factory district and subjected to reasonably heavy traffic. The work was done by city forces and, being an experimental pavement, was given every attention." In 1917 certain surface cracks appeared near the center or crown of the pavement which, upon investigation, were found to extend through the base to the subgrade. Longitudinal joints had been placed between the pavement and the concrete gutter, but no transverse joints had been used. "The cracks in the pavement were cleaned out, filled with asphaltic cement and have not been touched since then.

"Outside of the few cracks that appeared in 1917, we have had little trouble since that time, and the pavement is now in a reasonably good condition and shows little signs of wear."

Punxsutawney, Pa. Harry M. Walker informs us that a 3-inch brick pavement 30 years old "has not been altogether satisfactory and is not giving good service at the present time, due to the faulty construction. The condition of the pavement now is very bad, the surface rough and uneven. Where the pavement has been subjected to heavy traffic it can no longer be considered a good pavement; however, where the traffic was lighter and perhaps the pavement laid on a better base, it is in good condition. As to the cushion and filler used, much of this pavement was laid on rolled slag with one-inch sand cushion and sand filler. Where the pavement was laid this way it required a great deal of repairing every year.

"However, we have some three-inch brick pavement that was laid on concrete base with cement grout filler, which is rendering satisfactory service, and where it has been undisturbed the surface is in good condition at this time. This pavement has been in service approximately 15 years."

Fernandina, Florida. Concerning a 3-inch pavement 14 years old in Fernandina, city manager E. C. Garvin, who went there recently from St. Petersburg, Fla., says:

"The pavement is in good condition, generally. Carried light traffic. Repressed brick.

"No actual record of cost of repairs, but I understand this has been very moderate. Base is composed of oyster shell about 6 inches thick; sand cushion; oystershell dust filler (though sand filler was used in the original construction).

"St. Petersburg also has pavements at least 14 years old of repressed brick 3 inches thick. During widening process in 1923 this was relaid alongside of new brick of same thickness and you could hardly tell new brick from old in finished pavement."

Goshen, Indiana. City engineer R. P. Weaver informs us that there is in that city a brick pavement less than 3 inches thick and 33 years old, which is in fairly good condition, except that it is rather rough due to the fact that it was laid before the water and sewer connections had been made and was laid upon a gravel base with a sand filler. This pavement forms part of the Lincoln highway, and in addition to the traffic on that highway, it also carries heavy traffic to several factories, two railway stations and two railway freight houses.

About ten years ago this pavement was taken up and the brick turned and relaid. This is practically all that has been done to this pavement since it was laid 33 years ago.

Dodge City, Kansas. City engineer Fred Kirkpatrick writes: "The entire down-town district of this city is paved with 3-inch vertical fiber vitrified paving brick manufactured in the state of Kansas. The most of this district was paved in 1914. Since 1913, the city has spent less than $1,000 for repairs to pavement; in fact our maintenance costs have been too small to figure on a square yard basis per year.

"The following are specifications for pavement in

this district: 3 inch vertical fiber vitrified brick on 5-inch concrete base: 1 to 1½ inches of sand cushion, with asphalt filler. Brick—20% abrasion test, standard brick rattler. Concrete base—Arkansas river sand, pumped over a screen to eliminate quick-sand, one part cement to 7 parts sand. Sand cushion—principally quick-sand. Asphalt—various brands of the same quality as Texaco No. 32.

"The few repairs we have made were caused by faulty construction joints in the pavement base, the majority being what is called a lapped joint; expansion causing these joints to creep, break and distort the brick surface. We are now using a square construction joint.

"A part of the above described district is traversed by the Santa Fe trail, a national highway carrying thousands of vehicles a year. This district also has extremely narrow streets which is another cause for very heavy traffic. All of these streets are in very good condition."

Neodesha, Kansas. F. T. Russell, secretary, Chamber of Commerce, informs us that 3-inch brick pavement has been in service in that city for 10 to 15 years and is carrying a fair amount of traffic for a city of that size, although this would be considered light in a large city. The base under part of this is limestone macadam, and under other parts is 5-inch to 6-inch concrete with 1-inch sand cushion and asphalt filler. Practically all the materials used were obtained from nearby, the brick being manufactured in Neodesha and the asphalt by the Standard Oil Co. of Kansas. It is the opinion in that city that 3-inch brick pavements on a 6-inch concrete base with a 1-inch sand cushion and asphalt filler can be built so as to be successful for the average city.

Incidentally, Neodesha is nearly 100% paved. It has about 152,000 square yards of brick pavement which has been laid over a period of several years. 1927 will probably see all streets paved, with the possible exception of several blocks which have recently been taken into the city.

Wichita, Kansas. P. L. Brockway, city engineer, in reply to our inquiry sends the following information:

"Previous to 1915 all our brick pavement was the repressed type 4 inches in depth. At that time the paving brick manufacturers in this territory began to promote what they termed vertical fiber brick. Our experience leads me to the conclusion that the rough surface of the wire-cut brick will not resist abrasion as well as the smooth surface of the old repressed blocks. However, the old type bricks were so apt to have laminated centers from the action of the press that they are much more easily broken than the paving brick which are not placed in the press, so that the net result is perhaps advantageous.

"The first fiber brick were 4 inches deep, 4 inches wide, 8 inches long, weighing from 10 to 11 pounds, and were expensive to handle all the way through because of size and weight. Manufacturers immediately followed this up with a campaign to introduce brick of the same width and length but 3 inches in depth. Our first 3-inch vertical fiber, wire-cut brick, were laid in 1915. Two blocks were built, leading from a main thoroughfare into a flour mill district. These brick were subject to the 20 per cent maximum loss in a standard rattler, laid on 5-inch base with 1½-inch sand cushion and asphalt filler.

"We made one traffic count in 1924 which showed about 800 vehicles per day on a street 30 feet in width. There has been very little variation in traffic throughout the entire period, as there has been very little change in industrial development in the neighborhood. This pavement is in first class condition today. It has required no maintenance and is apparently good for at least 20 years yet. We have very little icy and snowy weather in which tire chains are used.

"In 1916 we laid 34,000 yards of brick pavement under the same specifications throughout. It was all constructed in purely residence districts, most of it carrying not more than 300 to 400 vehicles per day, except one street which is a main entrance into a residence district from the center of the city and which carries probably 1,500 to 2,000 vehicles per day. All of this pavement is in excellent condition, the only maintenance necessary having been caused by cracks in the base over shifting subsoil which let the sand cushion run out and the brick fall down. These have been repaired by simply lifting the brick over the crack, mixing a small amount of cement with the sand cushion, and replacing. All these pavements are in excellent condition.

"In 1916 and 1917 we constructed pavement on two streets totalling about 9,500 yards with 2½-inch brick under the so-called "Monolithic" specifications, which included the construction of about 4 inches of ordinary concrete base with 1 inch to 1½ inches of dry mixed mortar spread over the concrete while fresh, screeded and moistened and the brick laid immediately, then lightly rolled into the cushion and filled with cement grout, the intention, of course, being to make a monolithic structure as indicated by the name. We placed expansion joints as nearly vertical through the base and top as possible, using pre-case asphalt strips at 30-foot intervals. This specification is not successful because the brick and the base do not expand together under moisture and temperature, and changes in volume. We did not have as much trouble with cracking from over-compression as was experienced with similar pavements without expansion, but we did have to repair a number of the joints and did not continue to construct under this specification any longer. The pavement is still in fair condition although there are a number of bricks badly crushed and buckled. Traffic is very light.

"In 1917 we constructed approximately 25,000 yards under the same specifications as used generally in 1916, in the same kind of neighborhoods with about the same kind of traffic, except that a small portion was constructed on a street which is now the main thoroughfare into the city from a paved highway. Present day traffic is probably 10,000 vehicles a day, continuing for the last five years. This pavement is also in excellent condition.

"In 1918 we constructed nearly 60,000 yards under the same specifications and under the same general traffic conditions and with the same results. In 1917 we had tried using a sand cushion one inch in thickness but did not continue it longer because

Use of brick less than four inches thick

City	Amount laid, sq. yds.	Thickness, inches	How long in service
Alabama:			
Birmingham	90,000	3½	7 months
Arkansas:			
Little Rock	639	3	7 months
Connecticut:			
Ansonia	3,600	3	2 years
Derby	5,000	3	1 & 2 years
Meriden	5,208	3½	3 years
Wallingford	....	3½	13 years
Delaware:			
Wilmington	2 squares	3	2 years
Florida:			
Fernandina	15,000	3	2 to 14 yrs.
Jacksonville	25,000	3	3 years
Lakeland	All	3 & 2⅝	3" 2 years, other this yr.
Illinois:			
Alton	2,584	2½	Laid in 1925
	19,798	3	0 to 5 years
Batavia	33,000	3	3 years
Bloomington	80,000	3	1 to 3 yrs.
Cairo	....	3½	20 years
Canton	20,000	3	5 years
Carbondale	60,000	3	Some 4 yrs.
Kewanee	6,767	2¼	A few mths
Lawrenceville	75,000	3	1 to 5 yrs.
Macomb	12,000	3	3 years
Normal	55,000	3	6 years
Rockford	....	3	2 years
Waukegan	....	3	7 years
West Chicago	30,000	3	2 years
Indiana:			
Decatur	7,436	3	6 months
Goshen	3 miles	3	20 years
Lebanon	1,200	3	2 years
Logansport	20,000	2½	1 year
Washington	2,900	3	3 years
West Lafayette	10,000	3	4 years
Iowa:			
Centerville	3,717	3	1 year
Clinton	31,000	3	5 years
Council Bluffs	9,000	3	2 years
Creston	12,500	3	6 years
Davenport	28,000	3	First in 1921
Des Moines	All	3	......
Forest City	30,000	2½	10 years
Iowa City	All	3	Many years
Keokuk	4,000	3	3 years
Mechanicsville	200,000	3	3 to 5 years
Kansas:			
Atchison	150,000	3	1 to 10 yrs.
Augusta	All	3	2 to 10 yrs.
Dodge City	300 000	2½ & 3	9 & 13 yrs.
Independence	All	3	10 years
Lawrence	3,000	3	6 months
McPherson	18,500	3	......
Manhattan	26,000	3	2 to 13 yrs.
Neodesha	....	3	4 to 14 yrs.
Newton	2 miles	3	1 to 15 yrs.
Parsons	4,240	3	7 months
Wichita	40%	2	10 years
Louisiana:			
Minden	16,000	2½	8 years
Massachusetts:			
Pittsfield	42,288	3 & 3½	3 to 8 yrs.
Michigan:			
Battle Creek	12,800	3½	9 years
Kalamazoo	....	3	Laid in 1925
Lansing	5,800	3	4 months
Port Huron	7,500	3	5 years
Minnesota:			
Mankato	29,900	3	3 years
Minneapolis	38,086	3	7 yrs. & less
Rochester	55,000	3	4 years
South St. Paul	5,800	3	1 to 2 yrs.
St. Paul	300,000	3	3 years
Mississippi:			
Laurel	125,000	3	1 to 7 yrs.
Vicksburg	All	3	......
Missouri:			
Jefferson City	4,500	3	10 years
St. Joseph	50,000	3	1 to 10 yrs.
Sedalia	43,390	3	8 to 10 yrs.
Nebraska:			
Fairbury	All	3	1 to 8 yrs.
Havelock	....	3	11 years
Lincoln	45,600	3	10 yrs. & less
Omaha	50,000	3	10 years
York	....	3	2 to 17 yrs.
New York:			
Geneva	50,000	3	10 years
Johnson City	5,300	3	3 years
Syracuse	2,990	3	Laid in 1925
North Carolina:			
Durham	15,000	3½	4 years
Elizabeth City	2,250	3	6 months
North Dakota:			
Fargo	10,000	3	Since 1920
Ohio:			
Alliance	15,000	3½	6 years
Ashland	3,216	3½	6 months
Ashtabula	3,700	3	14 months
Columbus	12,000	3	1 yr., some less
Dayton	20,000	3½	Laid in 1925
Lancaster	33,000	3	6 years
Lorain	7,500	3	2 years
Marion	....	3 & 3½	Since 1919
New Boston	16,455	3½	18 months
Ravenna	2,747	3½	3 months
Wooster	800	3	2 years
Youngstown	8,980	3	Laid in 1925
Zanesville	17,000	3	5 years
Oklahoma:			
Ardmore	3,479	2½	9 months
Muskogee	100,000	3 & 2½	5 years
Oklahoma City	50,000	3	Aver. 10 yrs.
Okmulgee	....	3	5 to 10 yrs.
Ponca City	Almost all	2½	7 years
Pennsylvania:			
Avoca	6,400	3	1½ years
Bradford	23,500	3½	2 years
Carbondale	18,771	3 & 3½	3 months
Corry	20,000	3	5 months
Dunmora	30,000	3 & 3½	15 to 20 yrs.
Easton	500	3½	2 years
Ellwood City	16,000	3	Laid in 1925
Franklin	3,000	3	4 years
Gallitzin	5,000	3	......
Greenville	15,000	3	2,000 yds. for 2 yrs.
Hazleton	6,548	3½	6 months
Meadville	100,000	3	1 to 4½ yrs.
Monessen	20,000	3½	......
Monongahela	11,000	3	4 years
Mt. Carmel	97,000	3¾	15 to 18 yrs.
Mount Union	15,000	3	5 years
New Brighton	6,000	3	4 years
Punxsutawney	100,000	3	10 to 30 yrs.
Sewickley	850	3 (hillside)	1 year
Sharon	26,070	3 & 3½	5 years
Warren	22,000	3½	1 & 3 yrs.
Wilkinsburg	1 mile	3	3 years
Williamsport	44,000	3	Laid 1922 & '25
Tennessee:			
Jackson	27,600	3	1 year
Texas:			
Amarillo	All since 1912	3	1 to 9 yrs.
Corsicana	All	2½	3 yrs. & less
Childress	35,000	3 & 2½	Since 1920
Dallas	13,500	3	2,500 in 1919, 11,000 in 1924
Houston	29,678	3	12 yrs. & less
Snyder	8,500	2½	Laid in 1925
Waco	....	2½	1 to 25 yrs.
Virginia:			
Lynchburg	50,000	2¼ to 3	1 to 5 yrs.
West Virginia:			
Clarksburg	60,000	3	3 mths. to 7 yrs.
Fairmont	5,000	3	A few years
Princeton	15,000	3½	4 years
Wisconsin:			
Appleton	2,776	3	Few months
Kenosha	100,000	2½	4 to 7 yrs.

it is very difficult to make brick in this territory which are as free from distortion as they are in some of the eastern plants and the thin sand cushion made it practically impossible to roll the brick down to a reasonably smooth surface. We, therefore, returned to the 1½-inch sand cushion.

"We have continued to lay the 3-inch brick up to the present day. We occasionally specify 4-inch brick on streets leading into freight houses or similar locations. We are convinced that there are no advantages to be gained in using brick thicker than 3 inches on residence streets or on average thoroughfares unless the locality is such that there is considerable use of tire chains causing excessive abrasion. In that event the extra thickness of brick would be well worth the difference in price.

"As to the use of brick thinner than 3 inches, we were confronted with a very practical objection, namely, that the manufacturers apparently cannot produce a 2½-inch brick any cheaper than a 3-inch brick because of excessive loss in kiln distortion. The only difference in price, therefore, lies in the difference in freight due to difference in weight.

which, when applied to a square yard or even a block of pavement, is so slight a saving that it is not reasonable to compare the cost of one pavement with the other. We are in this situation, therefore, that we have expressed our willingness to use 2½-inch brick on secondary residence streets provided there is enough difference in cost quoted to make it attractive. I anticipate that it would be very difficult to go before any group of tax payers and persuade them to accept a 2½-inch brick at the cost of $1.50 or $2.00 less than 3-inch brick for the average building site, out of a total expense of $250 to $300. I have no doubt that this point, if it does exist in other places, has been entirely overlooked in the propaganda for the use of extra-thin brick."

Lincoln, Nebraska. D. L. Erickson, city engineer, states that practically all the brick pavement in Lincoln that has been laid during the past twelve years has been 3-inch vertical fiber on a 5-inch portland cement concrete base with a sand cushion originally 2 inches thick but of recent years 1 inch. One street paved in 1915 with 3-inch brick on 5-inch concrete base and 2-inch sand cushion is on a half-section line and has been subjected to considerable heavy hauling. Practically no repairs have been made to this street except adjacent to the street car track and where openings have been made for sewer and water connections. No instances have been found where the brick were broken by traffic and the pavement is in excellent condition at the present time. "In our opinion a 3-inch brick pavement with a 1-inch sand cushion and 5-inch concrete base makes a first class pavement that will stand up under any traffic that could reasonably be expected in a city of this size."

Waco, Texas. V. G. Koch, city engineer, writes: "The city of Waco has approximately 20,000 square yards of pavement constructed in 1913 by Ockander Brothers as a contractor, the said brick pavement being 2½ inches, brick laid flat with 5-inch 1-3-6 concrete base with a 1-inch sand cushion, using asphalt filler. This is the oldest brick pavement in this city that is under 4 inches in thickness. The above mentioned pavement has had no maintenance cost at any time since it was constructed and is in excellent condition at this time. The pavement referred to carries as heavy traffic as we have in the city of Waco."

Repair of Asphaltic Type Pavements in a Small City

Manhattan, Kans., maintains nearly a half million yards by use of a portable repair plant at satisfactorily low cost

By H. W. Alexander*

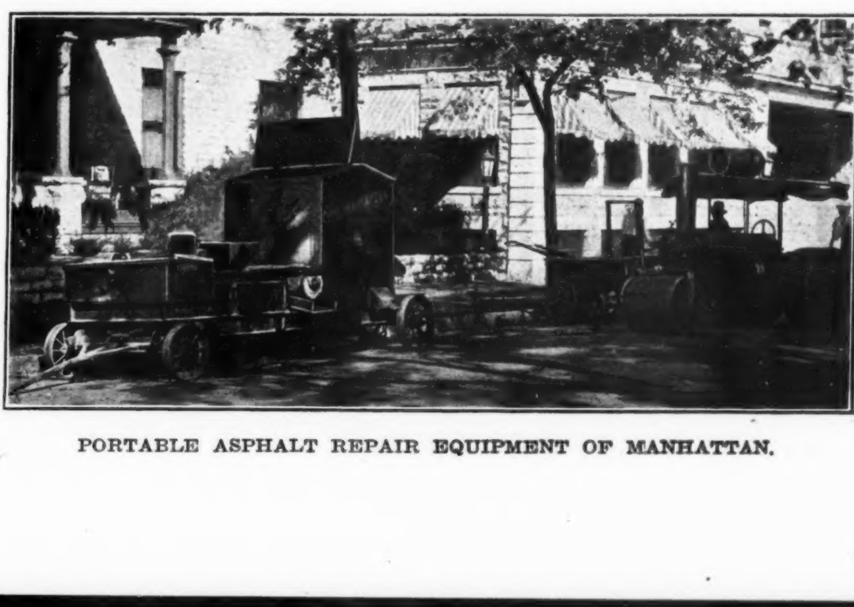
The repair and maintenance of asphaltic type pavements presents somewhat of a problem to city officials in small municipalities. How this work is handled in a typical middle west town may be of interest and value to other small cities.

Manhattan, Kansas, is a small city having a population of approximately 10,000 inhabitants. The first pavement was laid in 1910. Since that time, progress has been rapid in the matter of paving and at present there is a total of over 540,000 square yards of all types of pavements. Of this total yardage, by far the greater amount is asphaltic type pavement, of which approximately 266,000 square yards is asphaltic concrete and approximately 176,000 square yards is sheet asphalt. The average age of the asphaltic pavement is ten years.

The maintenance and repair of this comparatively large yardage of asphaltic type pavement presents a problem for the small city with limited finances and limited equipment for doing the work. Previous to last year, the city of Manhattan possessed little equipment for this work, with the result that whenever repairs became necessary such work was let under private contract with a resultant high cost. Last year, however, the writer, together with the commissioner of public utilities, was authorized to investigate and purchase the equipment for asphalt pavement repair as described below.

The equipment obtained consists of a portable repair plant manufactured by the Wylie Machinery Company of Oklahoma City, Oklahoma; an Austin "Pup" roller manufactured by the Austin-Western Road Machinery Company of Chicago; and the necessary tools, fire box, etc., for doing the work. The cost of the roller was $1,852 and of the repair plant $1,656.73.

In determining the proper type of mix for the



PORTABLE ASPHALT REPAIR EQUIPMENT OF MANHATTAN.

*City engineer, Manhattan, Kansas.

repair work it was decided to use a straight sheet asphalt mix on all classes of repairs. Local sands, rock dust and 40 penetration Texaco asphalt were used in the mix. Sieve tests were made on fine bank sand and river sand, and decision made to use the two sands combined in a one to one mix. A typical sieve analysis of the sand mixture is as follows:

Retained on	No. 10	mesh	4.2%
Passing 10, retained on	30	"	26.4
Passing 30 " "	50	"	21.2
Passing 50, " "	80	"	9.5
Passing 80, " "	200	"	21.9
Passing	200	"	16.8
	Total		100.0%

For a 100 pound batch, 40 lbs. each of the bank sand and river sand, 10 lbs. of rock dust and 10 lbs. of A. C. were used. The aggregates used were checked from time to time by sieve analyses to insure uniformity in the mix.

The repair plant consists of bins for heating sand and rock dust, and an asphalt kettle, all mounted over a large fire box; a pug mill operated by a 2 h. p. gasoline engine; a box for carrying coal; and a tool box. The whole is mounted on wheels, making the outfit portable. The asphalt kettle has a capacity of ninety gallons and the sand bins a capacity of 15 cubic feet each. The total weight is approximately 5,500 lbs. when empty. The roller weighs four tons and is operated by a Fordson tractor engine, using either gasoline or kerosene for fuel. The roller is used for compacting the patches and also as a tractor in moving the machine from place to place.

A gang of five men was used in doing the work, consisting of a foreman (who is also the roller man), a raker, a tamper, a mixer man and a barrow man. The sand and asphalt were heated to a temperature of about 300 degrees F. and were then drawn from the bins and kettle by the mixer man in the proper proportions and placed in the pug mill. The sand was measured by means of half-bushel buckets which had been marked to indicate the height which would give the desired quantity, and the asphalt was dipped out of the tank by a half-gallon dipper. Four units of each of the two kinds of sand, one of asphalt and one of rock dust constituted a batch. After the batch was properly mixed it was wheeled by the barrow man to the patch and there was spread, raked and tamped. When the patch had cooled sufficiently, it was rolled until thoroughly compacted. The patch was finished by sweeping a coating of portland cement over it.

The holes to be repaired were prepared while waiting for the plant to heat up, the whole gang being used in this work. The holes were trimmed back until all the rotten and disintegrated asphalt had been cleaned out, and were then thoroughly swept until perfectly clean. Hot asphalt was then painted around the edges of the hole and sprinkled lightly over the bottom. This was done to insure a proper bond and seal between the new asphalt and the old. The patches varied in area from less than a square foot to more than twenty square yards.

It was found that in order to operate the plant satisfactorily, it was necessary to have the sand perfectly dry before being placed in the hoppers. A sand dryer was improvised from a discarded well casing and one man worked full time on drying sand. The sand as dried, and while it was still hot, was hauled by truck to the repair plant and there placed in the bins. It is our intention to purchase a sand dryer this year for doing this work, as we believe it will more than pay for itself in the saving in labor expense of the somewhat slow process of drying over the well casing.

The foreman was required to fill out daily reports showing the number of batches put through the machine, the amount of material used being figured from the number of batches. His report also showed the number of square yards repaired, the average thickness of the patches, the labor cost for the day, time of starting and stopping work, cause of delays, condition of the weather, detailed location of the work and any other thing which might have a bearing on the work. These reports were turned into the engineering department, where they were worked up into cost figures for each day's operation. The reports were in duplicate, one report being filed in the engineering department, while the other was turned over to the public utilities commissioner.

The plant began operation in September and was closed down for the winter about the first of January. Details of cost of operation are as follows:

1. Labor.		
a. Cleaning and repairing equipment $	35.58	
b. Drying sand	161.60	
c. Laying asphalt	1,017.11	
d. Hauling material, cleaning up	243 75	$ 1,458.04
2. Maintenance of Equipment.		
a. Sharpening axes and picks $	10.50	
b. Repairs on asphalt machine	28.30	38.80
3. Supplies		
a. Asphalt axes and picks $	13.34	
b. Miscellaneous supplies	14.50	27.84
4. Kerosene and Gasoline.		
a. Gasoline, 56 gal., @ .20 $	11.20	
b. Kerosene, 515 gal., @ .11	56.65	67.85
5. Fuel		
a. Wood for drying sand $	103.48	
b. Coal for operating plant	98.96	202.44
6. Material		
a. Asphalt, 54.0 Bbl., @ $6.04 $	326.16	
b. Rock dust, 218 sacks, @ .19	41.42	
c. Bank sand, 52.9 cu. yds., @ .89	47.08	
d. River sand, 52.9 cu. yds., @ $1.65	87.28	
e. Cement, 5 sacks @ .80	4.00	505.94
7. Depreciation		
75 days @ $4.67		350.25
Total expense		$ 2,651.16
Number of square yards repaired	2,147.4	
Number of batches produced	2,694.	
Average cost per square yard		$ 1.23

We feel that the cost per square yard is satisfactory considering the fact that practically all the holes had to be cut out and the old asphalt removed. We feel that the cost can be materially reduced during operation this year as we are more familiar with the equipment and the method of operation.

Street Work in Coral Gables

Paved with bituminous macadam, using coral rock. Sidewalks and parking. Storm sewers, water supply, garbage disposal, street lighting.

By Reid Monford and E. Friedman

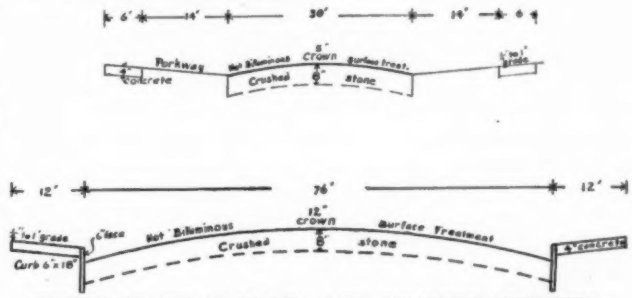
In combining utility with beauty to make Coral Gables, Florida, one of the most attractive cities of the world, George E. Merrick, owner and developer, has stressed the importance of streets, sidewalks, waterways, sewerage, garbage disposal, waterworks system and fire department.

In area Coral Gables covers sixteen square miles. The streets are laid out to follow a definite system which provides main boulevards that traverse the entire city. Business streets have widths of 70 feet; residential streets, a minimum of 60 feet; main business streets and boulevards a minimum of 100 feet. Several of the present boulevards measure 200 feet in width, and two are being built near the ocean front with a width of 300 feet.

All streets are constructed of broken stone base course eight inches thick, compacted, using local coral rock with hot surface treatment. This coral rock is unusually well-adapted for road purposes as it has a large percentage of calcium carbonate and magnesium, which give it a high cementing value. When this rock is thoroughly rolled and water bound, it becomes practically a solid mass. After rolling, the surface is broomed and hot road oil is applied with a self-propelled pressure distributor, immediately followed by an application of sand. This type of road is used almost exclusively in this vicinity and gives unusually good results at a cost of approximately $1.50 a square yard. There are at present in Coral Gables 150 miles of paved thoroughfares constructed at a cost of $4,000,000. Of this amount, 30.6 miles were constructed in 1925 at a cost of $1,010,000.

Sidewalks are constructed in two courses, 3¼-inch base course and ¾-inch top course. The usual type of construction is followed. All sidewalks, however, are colored with a small percentage of Fabric Okide, to avoid glare and to harmonize with the general coloring scheme of Coral Gables. There are approximately 300 miles of sidewalks in Coral Gables which have been constructed at a cost of $2,000,000, more than 60 miles of which were constructed in 1925 at an expenditure of $598,000.

Contracts have been let and work is under way for 66 more miles of paved streets, and 132 miles of sidewalks.



SECTIONS OF 70-FOOT AND 100-FOOT STREETS, CORAL GABLES.

Streets in residential sections are built without curves, to avoid a mechanical appearance, and are designed for a planting strip between sidewalk and paving. Trees, shrubbery, and flowers are planted in this parking strip. Sidewalks, landscaping, and streets blend to produce harmony in appearance. Storm water also is taken care of in this planting strip, soaking into the ground here because of the porosity of the

ALHAMBRA CIRCLE; A BUSINESS CORNER IN CORAL GABLES.
In the foreground, two street lamps; on a standard at the right, and on a post at the left. Near the right-hand corner, street signs swinging from a concrete post. In the background, business street paved the entire width.

A BUSINESS STREET PAVED FROM CURB TO CURB

coral rock which underlies all the area of the city. Business streets are paved from curb to curb. The two main boulevards are traversed by a street car line and rapid transit system.

Approximately 35 miles of waterways have been dredged in Coral Gables. In general, these canals have been dug by floating types of dredges. These waterways have a depth of seven feet of water, and a minimum width of a hundred feet. The future will see the increase of this depth to twelve feet to accommodate yachts and barges. The entire waterway must be blasted in advance of the dredges. Approximately $2,000,000 has been expended in this work.

The city of Coral Gables is constructing six miles of storm sewers to provide drainage for the business areas, where surface drainage is necessary. The sewer system is designed for a gravity flow to empty into one of the waterways. The installation is unusually difficult due to the large quantity of ground water and occasional pockets of quick-sand which are encountered. Water stands to a depth of 8 feet in the outfall line trench, which is approximately 14 feet deep. Minimum grades are used. The installation of this system will cost $175,000.

Sanitary sewage is taken care of by individual septic tanks, which function extremely well, because of rigid supervision as to design and installation, and by virtue of the natural porosity of the underlying soil and rock. A city sewerage system is being designed and probably will be started within the next year. Flat country, low elevation above sea level, long outfall lines, necessity for pumping and difficulty as to final disposal all combine to make a complicated problem.

Garbage is collected regularly and is disposed of by incineration. At present approximately 30 tons of miscellaneous refuse is disposed of daily.

There are approximately 47 miles of cast-iron water main installed, and 63 miles are being laid. Cast-iron pipe from 4 to 20 inches in diameter is being used. The water supply is being obtained from three wells ranging in depth from 74 to 82 feet, with electric pumps and gasoline driven standbys. These pumps have a combined capacity of 1,000,000 gallons a day. A new pumping station, with a capacity of 3,000,000 gallons a day, is under construction. $1,000,000 has been spent on the waterworks system.

The Fire Department of Coral Gables, has three American La France pumpers of the latest design, each capable of delivering 750 gallons a minute, and one chemical apparatus.

The electric department has completed 45 miles of white-way lighting and 45 miles of intersectional lighting. The present rate of consumption is 1,000 kilowatts a day.

Outcropping very close to the surface with a thin layer of top soil, the coral rock formation covers practically the entire area of Coral Gables. There is also a great deal of boulder rock, generally not exceeding 12 inches in diameter, on the surface of areas which have never been cultivated. In general, the entire area is gone over with a tractor, usually of ten to twelve-ton capacity, with a scarifying attachment. This scarifier, which usually weighs about 2000 pounds, is dragged along the ground surface by the tractor and it digs up boulders and rocks, breaking up and crushing the rock into small fragments. The actual weight of the tractor tends to crush the rock.

Clearing is usually necessary in advance of scarifying, small, scrubby pines and palmettos being removed and large pines and oaks being left. Trees

A CORAL GABLES WATER TOWER

ordinarily are pulled up by a cable attached to a tractor, although in some instances dynamite is used. In general, stumps are dynamited.

Sub-grade for streets is prepared by scarifying and, when the grade follows the ground surface very closely, the street is rough-graded by a grader drawn by a tractor; but, wherever there is over six inches of cut, mechanical shovels are utilized. As the sub-grade is generally of rock, or within an inch or two of rock, rolling is unnecessary, and crushed stone is placed directly on the rough-graded sub-grade. Crushed stone is deposited on the sub-grade to a depth of six inches, which rolls down to about four inches, and roughly graded with a one man grader, after which it is rolled with a ten to twelve-ton roller. After rolling, the street usually is open to traffic for two or three weeks. Prior to the completion of the road the street is scarified by a roller with a scarifier attachment, and reshaped. It is

then sprinkled and rerolled and traffic is kept off it. After the roads are dry an application of three-eighths of a gallon of hot oil per square yard is applied by a pressure distributor, and sand is thrown on the surface to absorb the excess oil. Another light application of oil is put on thirty days later, if there is sufficient traffic to justify its use.

It is necessary to use dynamite in loosening the rock in the entire canal area. Holes ordinarily made by air drills, about 18 feet deep, are placed on a three-foot center and six sticks of dynamite are used for each hole.

OPENING UP A NEW STREET

SOME ADDITIONAL INFORMATION

In addition to the above, some facts obtained from other sources may be of interest.

Coral Gables is an incorporated city under a commission form of government, which functions through a city manager. The commission is composed of Edward E. Dammers, George E. Merrick, Telfair Knight, C. F. Baldwin and F. W. Webster. The assessed valuation of the property at the end of 1925 was about fifty million dollars. The budget for its first year as a city contained $44,400 for street cleaning and removal and disposal of garbage and $50,000 for street lighting and repairs. The only municipal bonds so far issued was for the amount of $550,000, sold at a price to yield 5.77 percent.

The water rent charge is $1 a month. Current for lighting ranges from 12 cents to 5 cents per k. w. h., and from 7 cents to 3 cents for power and from 5 cents to 3 cents for heat; with minimum rates of $1 a month for light and $1.50 a month for heat. At the time this information was obtained, there were about 1,500 dwelling houses, 50 apartment houses and six hotels, with about 1,000 additional homes under construction or provided for.

A new development is announced which will be known as the Biscayne Bay section, adjoining the southern boundary of Miami and with six miles of ocean frontage. Among the principal streets in this section will be a 100-foot boulevard to be known as Ridge Road and another 150-feet wide along the water front, which will be provided with white-way lighting.

In constructing the storm sewer described by Mr. Monford (which work is in charge of J. I. Ellington, representing the J. B. McCrary Engineering Company of Atlanta), a "Northwest" ditcher was used for the entire depth. As the trench is extended several feet below groundwater level, several pumps are required to keep the water down during construction. After laying of the sewer pipe, the ditcher is used for back-filling the trench.

Pressure and storage of water are provided by three elevated water tanks, which are enclosed in concrete towers which are given a stucco finish tinted to correspond with the other buildings.

Tearing Up Old Pavement

In removing some old concrete and macadam pavement at Barton, N. Y., preparatory to repaving the streets with concrete, the contractors, DiPiilo and Balistreri of Geneva, employed a method in removing the concrete that seems to us to be unusual.

The concrete pavement was in slabs six inches thick, nine feet wide and of lengths which approximated twelve feet. Instead of breaking this up with heavy sledges, the contractors, using a skimmer bucket such as is employed in grading roads, caught the bucket under the edge of a slab of concrete and raised the boom and the slab with it, at the same time propelling the machine forward until the slab had been raised to a vertical position and then, with a little additional thrust, fell onto the slab in front and broke into small pieces.

This job was 4.8 miles long, one side concrete slab pavement and the other side old-fashioned ma-

STREET IN A RESIDENTIAL SECTION OF CORAL GABLES

BREAKING UP CONCRETE PAVEMENT

cadam road with tar penetration. T. W. Leonard, who operated the machine for the contractors, states that it would break up and load 80 to 100 lineal feet of this road per hour, or 800 to 1,000 feet in a ten-hour day. The machine used was a Bay City Model 16B convertible excavator with standard skimmer scoop equipment.

Estimating Future Water Consumption

Every superintendent or engineer in charge of a water supply must necessarily form some opinion concerning the amount of consumption that will be required in the future; for practically all cities in the United States are increasing more or less rapidly in population, and a majority of them find the per capita consumption of water increasing also, except where a program of metering reduces the per capital rate during the few years of carrying out such program.

It therefore is very important to be able to make an estimate of future consumption with greater or less accuracy. This subject was discussed in an article presented last fall before the Pennsylvania Water Works Association by Leonard Metcalf. Mr. Metcalf had collected definite information from 29 cities wherein more than 80% of the services were metered; the average of all the cities running about 98% metered. Diagrams had been prepared showing the increase in per capita consumption with the growth in population for different cities. On the basis of the data, which he had obtained directly from the water departments of the several cities together with as much as possible of the local conditions affecting the problem, Mr. Metcalf drew the following conclusions, stating definitely that "they are to be used only as an aid to judgment and as an additional criterion indicating apparent trends. Adequate local data, carefully analyzed, are of course likely to prove more significant."

"1. Annual or periodical data assembled at five-year intervals are badly needed, concerning the gross and per capita annual water consumption and the gross and per capita revenue derived from industrial service, commercial service, public service, and domestic service.

"2. The average increase in per capita daily water consumption with increase in population appears to be about 10 per cent of the increase in population, as indicated in table 3.

TABLE 3

Variations in per capita water consumption corresponding to given variations in populations from data for 30 representative cities.

Increase in Population	Increase in Per Capita Water Consumption
Per cent.	Per cent.
20	2
40	4
60	6
80	8
100	9

"3. The average decrease in per capita consumption of water, with increase in rates, is indicated by the figures in table 4.

TABLE 4

Variations in per capita consumption corresponding to given variations in water rates, from data from 30 representative cities.

Increase in Rates	Decrease in Consumption
Per Cent.	Per Cent.
20	13
40	22
60	29
80	35
100	40

"4. With water rates for large industrial services of from 10 to 13 cents per thousand gallons, the average per capita water consumptions appear to increase from 67 g.p.d. for populations of 25,000 to 73 g.p.d. for 50,000, 77 g.p.d. for 75,000, 80 g.p.d. for 100,000, 90 g.p.d. for 250,000, 98 g.p.d. for 500,000, and 107 g.p.d. for 1,000,000 population.

"The relative per capita consumptions increase with decrease in water rate and vice versa, as indicated by table 5. Thus, for industrial water rates of less than 10 cents per thousand gallons, the per capita consumption varies from 86 g.p.d. for a population of 25,000 to 103 for a population of 100,000 and 138 for a population of 1,000,000. Similarly the per capita consumptions for rates greater than 13 cents per thousand gallons decrease to 43, 52 and 70 g.p.d., all of which figures are comparable with those stated above as applying to industrial water service rates of 10 to 13 cents per thousand gallons, as shown in table 5.

TABLE 5

Average per capita water consumption for cities of different sizes, grouped according to water rates

	Per Capita Water Consumption (In gallons per day)		
	For cities with water rate (Manu't'ng)		
Population of City	Below 10 cts. per 1000 gals.	10 to 13 cts. per 1000 gals.	Above 13 cts. per 1000 gals.
25,000	86	67	43
50,000	94	73	48
75,000	99	77	50
100,000	103	80	52
250,000	116	90	59
500,000	126	98	64
750,000	132	103	67
1,000,000	138	107	70
2,000,000	150	117	76

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CONTENTS

Black Base and Thin Brick

Among the more important features of paving which are receiving attention at present and concerning which it seemed to us that data would be interesting are the use of black base and of thin brick. As to the latter, the Bureau of Public Roads is investigating the use of brick thinner than 3 inches but as the majority of brick surfaces are laid 4 inches thick it is, we think, interesting to learn something concerning the use of 3½-inch and 3-inch pavements as well as of those still thinner.

We accordingly present figures concerning the use of such pavements in more than one hundred cities, among which are several using brick thinner than 3 inches. Also letters from a number of cities concerning their experience with such pavements which have been laid for ten to thirty or more years. With one or two exceptions the reports are favorable.

Black base is reported by nearly one hundred cities (questionnaires returned since these figures were compiled will bring the total well over one hundred). Most of the cities use black base under sheet asphalt and bituminous concrete of one kind or another; but instances are reported of asphalt block, bituminous macadam and brick laid on such base. Black base seems to be more popular in the western than in the eastern states, just about half of the cities reporting it lying west of the Rockies although the cities so located are greatly outnumbered by those East of the Rockies. A table will be found in this issue giving the kinds of wearing surface laid on black base in the several cities and the dates on which they were laid.

Rushing Plans for Public Improvements

"The lack of a predetermined program for public improvements was keenly felt in this department during the past season. No opportunity was given during the winter months to prepare careful plans for various approved projects and consequently many contracts were awarded for improvements before the plans were finally completed in the detail necessary. This resulted in a disturbance of approximate quantities for bidding purposes that in one case, East Fifth Avenue, made it appear that one type of pavement was low on the bid while it was considerably higher on the final estimate. During the winter months more careful checking is possible with the organization available, and plans are prepared with greater attention to detail and accurate quantities, than when rushed through under pressure of orders to proceed at once."

From the report for the year 1925 of W. P. Cottingham, city engineer of Gary, Ind.

We have on several occasions expressed our opinion as to the desirability of deciding several months ahead on the work to be begun the following spring, for the double purpose of giving the engineers plenty of time to work out the best plans, and of permitting an early start on actual construction following a period between advertising for and receiving bids sufficient to permit contractors to thoroughly investigate the project. Each of these makes for economy of construction and effectiveness of result.

The above quotation cites an instance where compulsory haste in planning resulted in considerable increase in cost. It speaks for itself.

Dollars and Scents

"An old established site, well isolated, was available for the garbage disposal plant. The use of another site would have permitted the collection work with one less wagon, effecting a reduced annual cost amounting to about $5,000. However, it was decided that the security of the existing site against nuisance hazards was worth the extra cost."

This quotation from remarks by Samuel A. Greeley, made in replying to a discussion of his paper before the American Society of Civil Engineers entitled "Elimination of Odors from Garbage Disposal Works," suggests the importance to engineers of recognizing that engineering principles and costs (either first cost or total annual costs) should not always furnish the only arguments in reaching a decision in engineering matters. Local customs and prejudices, even though technically incorrect, must sometimes be recognized if the consent or funds are to be obtained that are necessary for carrying out the project.

For example, in the above case—a city of 140,000 population—it was apparently demonstrable that the use of the site desired by the citizens would cost $5,000 a year more than one recommended by the engineer. This is 3½ cents per capita per year, and if the citizens really preferred the less economical site and the plant could be operated there as effectively as at the other site, there is no reason why they should not be allowed to squander the 3½ cents for their pleasure in the matter. It is the engineer's duty to his clients, however, to make it perfectly plain to them what their choice will cost them.

But where the choice is between efficiency and inefficiency, and especially where between safety and danger, he should refuse to yield and should resign from all connection with the project if his employers insist on carrying it out against his conviction. Such, for example, would be a bridge designed with too small a factor of safety, a dam with too small a spillway or insecure a foundation, a sewer with a grade too flat to be self-cleansing, or a type of pavement that can not possibly carry the traffic it will receive. Here his duty to his client or to the general public is so clear and urgent and the probable result of his yielding so serious, that he should try his utmost to convince his client and, failing to do so, should resign all responsibility for the project.

An engineer who has consideration for his reputation and his future may find it advisable to take such extreme measures even though the objectionable features may not threaten serious consequences; his duty to himself certainly demands it if they do so threaten. We recall two instances when engineers allowed themselves to be over-persuaded by self-assertive clients who offered to "take the responsibility" and the results that were feared happened. Both were seriously discredited in their profession and one of them never "came back."

But, to return to our original text; if a city so objects to the most economical site for a garbage disposal plant, or to a number of scattered plants strategically located, that it will vote the project down rather than accept them; or if it insists on covering a standpipe with gold leaf rather than paint; or if local pride induces them to build a sewer of home-made brick instead of cheaper concrete: then—it is their money and they have a right to pay out some of it in carrying out their harmless idea, even if we think them foolish.

Notice of Publication Date

The date of issue of PUBLIC WORKS has been the 15th of each month, but due to various reasons, among them delays in the receipt of advertising copy, procrastination by the printers, etc., the issues have been mailed in most cases a week or so after the 15th.

This has caused some confusion. Therefore we have decided to call the number for this month the February-March issue and each issue after the February-March number will be in the mails a few days prior to the first of the month bearing its date. For illustration, the April number will be mailed about March 25th and so on.

The change affects only the date assigned to the issue—the same number of copies will go out during the year, one each month.

Leonard Metcalf

It is but a few months since the death of two of the leading consulting sanitary engineers of the country—Rudolph Hering and Geo. C. Whipple; and death has now claimed a third—Leonard Metcalf.

Mr. Metcalf was born in Galveston, Tex., in 1870, but most of his life has lived in Massachusetts. He graduated from the Massachusetts Institute of Technology, Civil Engineering course, in 1892. He began practising in his own name in Boston in 1897 and in 1907 formed a partnership with Mr. Eddy, the firm specializing in hydraulic and sanitary engineering, Mr. Metcalf devoting special attention to municipal water works, including their financial problems.

His most important accomplishments were in the field of valuation and rate making for public utilities. He was called as expert witness in water rate cases at San Francisco, Denver, Des Moines and other cities and was frequently employed as adviser to capitalists contemplating purchase of water companies.

During the war he served as member of the subcommittee on Emergency Construction of Buildings and Engineering Structures.

He was the author of numerous papers contributed to the American Society of Civil Engineers, the American Water Works Association and the New England Water Works Association. He was particularly proud of the three-volume treatise on "American Sewerage Practice" for which his firm was responsible.

He was a gentleman in all his instincts and acts; a man of broad culture, keen intellect and sound judgment; and an indomitable worker.

The Road Contracting Business

Discussion, at the convention of the American Road Builders Association, of the problem of how to improve the contracting business. Refuse to contract for public work, eliminate incompetent contractors, and "use the old bean" some of the solutions recommended.

A. R. Hirst, the chief engineer of the American Vibrolithic Corporation, read before the American Road Builders Association a paper entitled "Estimating the Job" in which his remarks on estimating were summed up in the statement: "If a contractor is going to stay in the open field of pavement competition, about all he needs to estimate with is the current reports of recent previous awards in the area; a knowledge of who is going to bid; a Ouija board; a rabbit's foot, and a good bank account."

In explanation he said: "Years ago I was instrumental in having made up and published by the Wisconsin Highway Commission, in co-operation with contractors and machinery and material men, a quite adequate cost sheet to be used in estimating the cost of rural concrete road projects. This sheet was much circulated and copied but has about disappeared from the field because it was really quite complete and contractors found that if they filled in all the items with intelligence and then bid the figures the sheet gave them, they never did get a job. They ceased to be contractors and became gentlemen of leisure."

In explanation of the reason for such unsatisfactory condition, he named 19 contributing causes for low prices in the highway field, as follows:

1. Open competition with widespread advertisement of jobs.
2. No bonus for speed.
3. No bonus for workmanship or quality.
4. No bonus for freedom from trouble in conducting the job.
5. Materials furnished by municipality in many cases, thus reducing financing required.
6. No preference on materials due to too generous lien laws and bonding protection to sellers.
7. Natural desire of machinery companies to sell their goods to anyone.
8. The number of bonding companies competing for business, some of whom will bond anybody. Many of these companies, when in doubt, increase the competition by bringing in new bidders who will bond with them.
10. The gambling tendency of almost all contractors.
11. Lack of continuous and consistent programs in most areas, leading to a building up of organizations and equipment during the peaks and a wild scramble for the few available jobs during the depressions.
12. General overcrowding of the highway contracting field.
13. General lack of really severe qualification of bidders.
14. The almost universal practice of giving any low bidder a job, provided he can furnish a bond.
15. Irresponsible and ignorant of cost sub-contractors who take details of the work from underbidding contractors at even lower prices.
16. Sales of motor trucks by some truck companies to anyone on shoestrings. These shoestring owners, totally ignorant of actual costs, subcontract hauling at far below cost, and give contractors who prey on their ignorance a great advantage over contractors who own their hauling equipment and know what it costs them to own and operate it.
17. Energetic, and usually successful, efforts made by most sellers of pavement materials to bring in low bidders on their especial type of pavement whenever several types are in open competition. In fact, this sustained effort of many large producers of materials to lower pavement prices is one of the most serious phases of the situation.
18. Constant introduction of new firms, new blood, and new money, and the seeming necessity that most of these new performers get at least one costly lesson before they settle down to normalcy, or pass out.
19. Desire of politically ruled municipalities to make a low price showing on the actual awards, regardless of the final outcome, which can well be covered up.

"The Remedy?—There is none remotely possible, in my humble opinion. The man who can suggest an effective cure for the present evils would deserve from the higway contracting fraternity a reward greater than any man in the construction field ever received.

"In conclusion, it is my impression that there is no collective way out of the present morass which can possibly give immediate results. Small groups of contractors can, in many cases, work out individual solutions for limited areas which will give immediate relief. Any real result can only come with the elimination of irresponsible competition in the area. As long as the competition is open to the world with the awarding body taking into account nothing but the prices bid, there can be no adequate reward for competent service, workmanship, speed and value of product. In my opinion, the really competent and able contractor who stays in the wide open public contracting field is wasting his time and his talents and is unfair to himself and to his dependents.

"To reiterate, the answer is not collective. It is individual, and each contractor or group of contractors must work out the answer in their individual area. The sooner good contractors stir themselves to find this individual answer the more money they will have with which to escape the poorhouse, if 1924 and 1925 have left them anything more than their happy dispositions.

"One of the very best solutions for competent contractors is to get entirely out of the public contracting game. There is much private contracting on which service, ability, workmanship and speed, does count. In fact, public work is about the only building operation which places no added price value on any of these things. I earnestly advise public work contractors to seriously consider transferring their operations to

the field of private work, where ability to deliver the goods often counts high, and where the dollars and cents of the apparent first cost is not the sole yard stick of value used by the buyer."

Selection of the Contractor

Discussing the same unfortunate condition as Mr. Hirst, Geo. B. Walbridge was more hopeful and constructive. He believed that the engineer, and ultimately the taxpayers, could be educated to appreciate that it is to their advantage to let public work to qualified contractors only, and at prices that would enable skilled contractors to make a reasonable profit.

"In order to select a responsible contractor," said he "the necessary qualifications are *Skill, Integrity, Responsibility* and *Profit.*

"Skill: He must possess the necessary technical knowledge and practical experience, as applied to his particular form or group of undertakings, to enable him to carry them to completion in a workmanlike and economical manner.

"Integrity: He must consistently and persistently comply with the spirit as well as the letter of his contracts. He must have business experience and handle every transaction with fairness and honor.

"Responsibility: He must possess cash or credit to meet all his commitments, also the equipment and organization for the satisfactory performance and completion of his undertakings.

"Profit: He must get enough profit to insure his best attentions, so the work can be properly and safely done, so he can pay taxes."

Urging contractors to aid in remedying present conditions, he said: "it is one of your great duties to help eliminate the irresponsible, and the standard questionnaire is the best method I know of today. This standard questionnaire is approved and recommended by the "joint conference on construction practices".

"To me, one of the greatest things it has done for the contractor is to make him check himself up, and when he does that thoroughly as this questionnaire requires, he will know more about his own business. I might say here that the Executive Board of Associated General Contractors of America have approved of the questionnaire and have recommended its adoption."

"When I tell you that, according to the statistical department of the United States Internal Revenue Bureau, 41.67% of the construction corporations filing reports covering work for 1921 showed no profit, you will realize there is something wrong. An analysis of the 41.67% showed:

38% of the highway and excavating contractors filing reports showed no profit.
25% of the building contractors.
50% of the railroad contractors.
42% of the dock and wharf contractors.
60% of the shipbuilding contractors.
47% of the wrecking and moving contractors.
42% of the equipment and machinery installation contractors.
40% included miscellaneous contractors.

"The percentage of those filing reports for 1923 and showing no profit was 35% which showed a slight improvement over 1921. An analysis of the 35% showed:

40% of the highway and excavating contractors filing reports showed no profit.
31.68% of the building contractors.
40% of the railroad contractors.
42% of the dock and wharf contractors.
55% of the shipbuilding contractors.
32% of the wrecking and moving contractors.
30% of the equipment and machinery installation contractors.
38.8% included miscellaneous contractors.

"The statistics of the United States Department of Revenue for the years 1921 and 1923 also showed the average gross profit for the contractors filing reports and showing a profit was two percent before deducting federal and state taxes. After deducting the taxes and without taking into consideration interest on unpaid capital, the contractors of the United States made an average profit of less than one and three-quarters percent.

"As further evidence of the unsatisfactory and uneconomic conditions, I would refer to the loss ratios experienced by one of the oldest, most conservative and responsible sureties companied for the years 1921, 1922, 1923 and 1924, which were as follows:

Loss Ratios Years	
1921-1924	CONTRACTS (OTHER THAN FEDERAL)
113%	Concrete roads and highways
94%	Water bound macadam highways
65%	Dirt, gravel, shell roads and highways
91%	Drainage and ditching
64%	Sewers, aqueducts, pipe-laying
37%	Refuse disposal plants
59%	Excavation and grading other than railroad
41%	Public buildings, construction other than concrete
55%	General construction except concrete
	FEDERAL CONTRACTORS
164%	Federal contracts—miscellaneous
51%	Harbor and river improvements
219%	Construction for Navy Department
141%	Construction for Interior Department—Miscellaneous

"In publishing the above figures the surety company stated "to the loss ratios must be added 50% to cover expenses".

"The above company also reported for the year 1923, 1790 defaults upon general construction work.

'Another conservative and well known company reported as having paid in losses for 1923, 92½% of all premiums received on road contract bonds, which did not include administrative expense, agents' commissions, federal, state or municipal taxes.

"Contract bond losses are eventually reflected in premium rates charged for bonds and are finally paid by the public.

"You are now asking the reason for such conditions and who is responsible. Primarily, I will say the general public, because it is in position to control all of the elements of construction and in the end the public is paying the bill from the present uneconomic conditions in the industry.

Practically every analytical study of the industry to ascertain measures necessary to clear it of existing conditions has lead to the same fundamental problems. Regardless of the methods considered, the ethics, financing, contracts, or contracting service, it has invariably resulted in realizing the public's failure to recognize distinction between classes of contractors, and their encouragement of commercial practices which continually induct irresponsible and dishonest individuals into the industry and maintain them there at the expense of reputable individuals, public and private owners."

Contractors Must Help Themselves

W. F. Creighton, chairman of the Constructors' Section, looks at the matter in an entirely different way. In his opening remarks he said: "I believe that we are approaching a new cycle in our industry.

. . . "Never in the past twenty years has competition been so keen as at present. . . . How shall the responsible contractor weather this storm? We must have work, and to meet competition at this time must figure a small margin of profit.

"The answer is first, in the language of the street, "Know your stuff", and as Ring Lardner would say: "Use the old bean." We must get the highest efficiency out of men and equipment; we must study material costs early and late; we must cut off all dead wood, and eliminate every penny of waste. How this may be done in some instances is the object of this program. We must keep in close touch with the latest discoveries of the various laboratories, studying the material we use; and our competitors' jobs, to glean every point that would enable us to improve methods.

"I listened, with some impatience, yesterday to a half expressed belief that engineers should help us by eliminating the irresponsible bidder, that they should even check up our bids, and if we are too low, give it to the next bidder; that the public should recognize our ability and give us a preference. Gentlemen, this is not the rule of business, and it is hopeless to expect such help. We must help ourselves.

"What I wish to impress on you—and I wish I had the eloquence of some of our southern orators to do it properly,—is that prices are low, but I believe are as high as we will ever see them, and the firm who continues in this business must mix a large portion of brains in it.

"The next question facing us, but one that the engineers are more responsible for solving, is to determine what is wrong with concrete. Those of us who have been mixing it for twenty years realize that we are not nearly so confident of results as we were when we first started. Some slight forward steps have been made by the Bureau of Standards, the Lewis Institute, and other investigators; but even now, neither chemists nor physicists know what takes place when cement sets; and the wise engineers are beginning to ralize that "concrete" is not a mere mixture of cement, water and aggregate.

"Our interest in this problem, is, of course, self-protection; because, as many of us know, we are blamed for failure, although our actions were entirely governed by specification and inspection.

For this reason, I say that it behooves us to study the field control of material. Later in the afternoon, if the occasion permits, I shall give you an example where extraordinary judgment was exercised in applying laboratory methods in the field, and to the surprise and gratification of the contractor, both results were obtained; that is, a saving in cost and an improved product.

"I do not intend to minimize, by these remarks, the value of the excellent papers we heard yesterday; but as Mr. Smith stated, it is to be expected that this bitter competition will last one or two years more; and by that time the contractor who does not thoroughly investigate his project and the specifications, who does not keep accurate costs and use the data thus obtained on future estimates, who hasn't the ability or energy to keep up with progress, will have folded his tents and vanished. Nor do I minimize the efforts of the A. G. C. to introduce the bidders' questionnaire, and insist on the indemnity companies correcting their present methods of approving incompetent bidders. But after all, any step taken by the A. G. C. is the united effort of the contractors to help themselves, which is the keynote of my thought."

City Paving Done in 1925

Statistics from more than seven hundred cities tabulated according to kind of pavement laid, giving the area and cost of each. Also data concerning use of thin brick wearing surfaces, of black base, quick-hardening cement and dust layers.

In compiling this year the statistics of paving done by municipalities during 1925, we wish to acknowledge our indebtedness to about seven hundred and fifty paving officials who have furnished the requested information concerning their respective cities. Only their cooperation enables us to give the official figures compiled in the following tables. It takes some time to tabulate and set up these tables, and in the interval a number of additional questionnaires have been returned, the information given by which will be published in a later issue.

(Continued on page 61)

Sheet Asphalt and Asphalt Concrete Pavements Laid in 1925

City and State	Sheet Asphalt Pavement Amount Sq. Yds. or Mi.	Sheet Asphalt Pavement Cost	Asphalt Concrete Amount Sq. Yds. or Mi.	Asphalt Concrete Cost
Alabama:				
Birmingham	$46,238	$121,997l	251,208	$588,034l
Decatur	....	....	24,113	30,141d
Florence	50,000	150,000f	....	....
Huntsville	....	....	10,000	22,000d
Montgomery	91,136	235,146e	......	....
Arizona:				
Tucson	....	....	29,000	97,884z
Arkansas:				
Fayetteville	....	....	30,000	74,500
Little Rock	28,631	....	....	....
California:				
Alameda	....	....	10,332	22,320d
Berkeley	....	....	15,167	50,000b
Chico	....	....	199,724	330,000e
Fort Bragg	....	....	24,000	54,965
Long Beach	62,830	189,923e	51,055	141,318e
Los Angeles	215,168	707,809d	48,010	92,211d
Pasadena	.....	....	39,870	96,883e
Sacramento	....	....	302,006	450,429d
San Diego	....	....	283,355	401,014
San Mateo	4,653	16,706f	....	....
San Rafael	....	....	16,330	31,900e
Santa Ana	....	....	28,948	52,029t
Colorado:				
Denver	....	....	562,610j	1,641,231l
		....	12,822k	40,156l
Connecticut:				
Hartford	74,492	172,676e	....	....
Meriden	32,722	80,133e	....	....
New Britain	....	....	9,355	25,905y
New Haven	74,500	97,200f	....	....
Willimantic	1,500	....	....	....
Delaware:				
Wilmington	34,100	2.89s	17,100	1.46sc
Florida:				
Lakeland	6,000	20,000f	....	....
Ocala	195,000	500,000m	....	....
Georgia:				
Americus	35,000	75,000	....	....
Cartersville	2.5 miles	166,385	....	....
Illinois:				
Cicero	4,453	....	....	....
Macomb	1,000	....	....	....
Indiana:				
Anderson	4,013	13,115	....	....
Bedford	....	3.35s	....	....
Elkhart	14,791	39,270a	....	....
Fort Wayne	23,255	83,935f	107,685	425,593f
Gary	58,811	328,766f	....	....
Huntington	31,198	123,197m	19,407	47,083m
La Porte	26,653	121,090a	4,425	32,220a
Logansport	44,000	96,000n	....	....
Richmond	5,240	22,733z	....	....
Vincennes	25,000	101,553n	4,500	16,005n
Washington	16,800	40,568	....	....
Iowa:				
Council Bluffs	29,248	65,883d	....	....
Davenport	46,305	146,228q	....	....
Des Moines	4,840	14,196	45,964	110,032
Sioux City	3,779	5,819	....	....
New York (Continued)				
Tonawanda	14,000	80,000h	....	....
Utica	426p	....	796	3,619h
North Carolina:				
Asheville	63,775	172,846d	5,486	8,309d
Greensboro	95,265	....	115,300	....
Ohio:				
Alliance	15,000	....	....	....
Barberton	11,127	49,600f	....	....
Cincinnati	5,300	13,000c	....	....
Columbus	35,000	....	....	....
Cuyahoga Falls	16,000	100,000u	....	....
Dayton	6,200	17,361h	....	....
Kenmore	....	....	10,700	46,500f
Lakewood	....	....	72,623	310,193h
Lancaster	12,798	47,420q	....	....
Lima	3,300	20,914v	....	....
Massillon	15,954	61,700e	....	....
Newark	13,124	41,231b	....	....
Niles	....	....	14,943	60,599f
Oberlin	7,500	33,400f	....	....
Orrville	2,450	7,772	15,458	61,354
Salem	....	....	49,000	....
Sandusky	1.148 mi.	67,008	....	....
Warren	29,502	148,417v	....	....
Wooster	45,000	118,000	4,000	8,000
Youngstown	83,820	257,788f	....	....
Zanesville	60,780	241,233w	....	....
Oklahoma:				
Claremore	....	....	5 mi.	50,000
Oklahoma City	20,000	100,000h	....	....
Tulsa	....	....	187,778	894,372
Oregon:				
Astoria	....	....	2,730	5,704h
Oregon City	....	....	44,000	43,120c
Portland	....	....	243,462	....
Pennsylvania:				
Butler	8,300	26,600	....	....
Clearfield	7,000	17,000e	....	....
Dunmore	20,000	100,000v	....	....
Duquesne	....	....	6,852	15,416p
Easton	....	....	250T	....
Grove City	3,767	20,238	....	....
Harrisburg	47,000	180,000e	....	....
Johnstown	14,621	80,995f	....	....
Kingston	64,000	200,000	....	....
Mahanoy City	....	....	10,000	40,000f
Monongahela	16,000	32,000c	....	....
Sharon	20,992	71,350x	....	....
Waynesburg	....	....	3,000	5,250d
Williamsport	28,417	94,768e	....	....
York	57,783	207,462e	....	....
South Carolina:				
Charleston	....	475,395	....	....
Tennessee:				
Jackson	7,800	22,400f	6,100	5,490c
Texas:				
Houston	....	....	115,559	....
Waco	....	....	103,746	298,960
Utah:				
Salt Lake City	....	....	1,473	4,910

Kansas:				
Chanute	6,293	10.194p	8.550	8,240p
Kansas City	....	....	36,071	124,794n
Lawrence	27,000	32,000p	10,000	25,000e
Parsons	42,330	1.39sp	....	....
Topeka	....	....	5.58 mi.	347,000
Wichita	29,294	111,911q	77,859	305,412q
Kentucky:				
Ashland	11,000	22,000f	....	....
Lexington	....	....	3,500	10,500f
Maine:				
South Portland	....	....	14,000	1.25sc
Maryland:				
Salisbury	1,700	4,870c	1,400	2,100c
Massachusetts:				
Arlington	....	....	14,550	36,375e
Lowell	....	....	40,150	....
Michigan:				
Ann Arbor	32,452	121,777f	....	....
Grand Haven	4,973	8,852	....	....
Highland Park	115,680	438,069n	....	....
Hamtramck	42,000	167,000d	....	....
Kalamazoo	83,652	....	....	....
Lansing	110,512	389,000b	....	....
Ludington	48,807	112,756r	....	....
Pontiac	10,000	65,000h	....	....
Royal Oak	10,583	46,182c	....	....
Minnesota:				
Minneapolis	....	....	105,863	298,834e
St. Paul	173,850	574,330e	62,850	210,000e
Mississippi:				
Columbus	35,000	75,000d	....	....
Corinth	80,000	115,200c	....	....
Missouri:				
Joplin	....	....	6,635	8,957e
Kansas City	57,096	189,771d	....	....
St. Joseph	....	....	{ 1,394 { 42,421	4,418d 59,456c
St. Louis	214,517	1,115,723h	25,151	143,242h
Montana:				
Great Falls	3,970	8,335e	....	....
Nebraska:				
Havelock	....	....	1,400	3,000
Lincoln	8,584	20,000z	115,108	366,872z
Omaha	96,671	230,754A	613,240	1,366,805d
Scottsbluff	35,500	108,168B	....	....
New Hampshire:				
Portsmouth	1,400	1,500t	....	....
New Jersey:				
Belleville	46,491	3.26s	....	....
Bergenfield	....	....	2,240	7,168d
Englewood	25,100	....	2,400	....
Haddon Heights	19,265	128,086f	....	....
Irvington	....	....	3,080	9,636d
Newark	307,704	1,665,000d	13,521	51,862f
New Brunswick	59,338	1.96sc; 3.08d	....	....
Orange	23,782	44,410	....	....
Plainfield	{ 30,828 { 7,037p	132,158f 8,655f	....	....
South Orange	6,000	....	....	....
Union City	8,000	16,000c	....	....
Wallington	3,322	10,132	....	....
West New York	....	....	9,000	17,325c
New York:				
Cortland	....	....	22,000	68,000f
Geneva	18,000	100,000	....	....
N. Y. City (Man. Boro.)	198,817	1,405,112t	....	....
Poughkeepsie	7,700	40,216e	....	....
Rochester	3,289,951b	1,445,277b	....	....
Syracuse	39,650	203,570f	43,590	217,330f
Vermont:				
Burlington	22,240	37,516e	....	....
St. Albans	0.5 mi.	3,000	....	....
Virginia:				
Lynchburg	9,100	11,186	....	....
Washington:				
Yakima	....	....	21,204	55,246h
West Virginia:				
Charleston	....	....	1,275	8,133h
Moundsville	....	....	14,000	20,000
Wisconsin:				
Green Bay	40,356	....	....	....
Kenosha	76,164	240,210f	29,954	90,255f
Oshkosh	....	....	13,969	38,685e

a—Entire improvement. b—Entire paving job. c—Wearing course only. d—Wearing course and base. e—Wearing course, base and grading. f—Wearing course, base, grading and curb. g—Includes grading. h—Wearing course, base, grading, curb and drainage. i—Includes grading for thickness of pavement. j—3 in. crushed rock sub-base, 2½ in. to 3½ in. base, and asphalt concrete surface. k—5" to 6" portland cement concrete base. l—Wearing course, base, grading, curb and gutter, alley crosswalks, incidentals, cost of collection, interest on deferred payments, etc. m—Wearing course, base and curb. n—Wearing course, base and grading, curb and gutter, catchbasins, manholes, inlets and sewers. p—Resurfacing. q—Grading, base, surface, curb and gutter and overhead. r—Wearing course, curb and gutter, inspection, and about half new 6" macadam base. s—Per square yard. t—Surface, base, grading, curbs, sidewalks, basins, inlets, etc. u—Includes underground structures. Asphalt costs about $1.60 a square yard. v—Grading, base, surface, curb and gutter and catchbasins. w—Resurfacing old brick pavement cost $2.15; with base, curb, etc, cost $4.80. x—Wearing course, base, grading, engineering and inspection. y—Includes preparing old pavement for base and resetting curb. z—Wearing course, base, grading, curbs, sidewalks. A—Of this, 13,190 was resurfacing, 1.57" top on 2.55" binder, costing $22,456. B—Surface, base, grading, curb, manholes and inlet adjustments. T—Tar concrete.

The general tables concerning pavements laid conform in general to those which we have published each spring for more than fifteen years. In addition we give synopses of the information obtained in reply to the following question:

How much pavement have you laid with brick less than 4 inches thick? What is the thickness of the brick? How long has it been in service?

Have you used any quick-hardening cement in your paving work? What kind of cement?

Have you any pavements in the city laid on "black base" (bituminous concrete)? What kind of surface was laid on such base? What year was it laid?

What materials do you use for laying dust?

Additional Asphalt Pavement Figures

Some figures relative to the several kinds of asphalt pavements laid last year were furnished to us by the Asphalt Association, and those for cities not included in our tables are as follows:

Sheet Asphalt: Akron, O, 100,000 sq. yd.; Chicago, Ill., 384,000 sq. yd.; Cleveland, O., 1,839,000 sq. yd. Fond du Lac, Wis., 25,000 sq. yd.; and Mansfield, O., 30,000 sq. yd.

Asphalt Macadam: Chicago, Ill., 53,800 sq. yd.

Warrenite-Bitulithic: Each of the following has laid over 100,000 sq. yds.—Aurora, Ill., Baton Rouge, La., Bellair Heights, Fla., Boston, Mass., Clearwater, Fla., Fort Pierce, Fla., New Orleans, La., Santa Monica, Cal. and West Palm Beach, Fla.

Asphalt Blocks: Maumee, O., 3,050 sq. yd.; New York City, N. Y., 81,770 sq. yds.; Niagara Falls, N. Y., 19,500 sq. yd.; Nyack, N. Y., 2,380 sq. yd.; Perth Amboy, N. J., 26,306 sq. yds.; Piqua, Ohio, 3,300 sq. yd.; Springfield, O., 13,000 sq. yd.; Urbana, O., 11,200 sq. yd.

Special Kinds of Pavement Laid in 1925

City	Amount	Cost
WARRENITE-BITULITHIC		
Birmingham, Ala.	$119,436	$318,107f
Montgomery, Ala.	16,832	22,259r
Tucson, Ariz.	17,790	80,073t
Little Rock, Ark.	40,869	....
Berkeley, Cal.	5,333	21,200b
Modesto, Calif.	33,678	69,713g
Pueblo, Colo.	30,000	97,500e
De Kalb, Ill.	9,200	19,000h
Rockford, Ill.	36,622	128,941v
Kewanee, Ill.	3,101	12,300i
Des Moines, Ia.	8,459	24,472
Keokuk, Ia.	9,662	18,340e
Kansas City, Kans.	3,398	12,843l
Brookline, Mass.	21,995	59,560
New Bedford, Mass.	2,810	7,676g
Somerville, Mass.	1.23 miles	1.90sc
St. Cloud, Minn.	63,403	194,210g
St. Louis, Mo.	105,449	575,349b
Billings, Mont.	25,297	65,206d
Great Falls, Mont.	....	69,793g
Helena, Mont.	18,000	65,000k
Kalispell, Mont.	11,400	21,208e
Havelock, Neb.	32,000	96,000e
Albuquerque, N. M.	65,487	232,830
Batavia, N. Y.	5,900	35,917e
Elmira, N. Y.	12,066	57,923b
Johnson City, N. Y.	1,429	7,921l
Lockport, N. Y.	7,211	65,977e
North Tonawanda, N. Y.	13,560	47,460g
Rochester, N. Y.	225,241	288,303b
Utica, N. Y.	75,282	5.17sb
Yonkers, N. Y.	18,322	78,785d
Newark, O.	14,007	38,915n
Oklahoma City, Okla.	10,000	50,000r
Allentown, Pa.	7,341	23,860g
Altoona, Pa.	9,001	42,629k
Grove City, Pa.	8,838	37,870
Johnstown, Pa.	3,302	9,618c
Lebanon, Pa.	9,700	44,559
Dallas, Tex.	117,643	461,385e
El Paso, Tex.	126,988	307,997e
Houston, Tex.	115,396	....
Waco, Tex.	32,911	101,658
Salt Lake City, Utah	18,504	49,619
Appleton, Wis.	22,254	61,643g
VIBROLITHIC		
Redwood City, Calif.	66,055	58,626e
Granite City, Ill.	46,000	213,000e
Kewanee, Ill.	33,327	115,356i
Lake Forest, Ill.	1,342	6,100
West Chicago, Ill.	80,000	....
Wheaton, Ill.	6,300	26,900
Laporte, Ind.	4,719	37,154
Council Bluffs, Ia.	4,876	13,180
Des Moines, Ia.	143,164	325,301
Kansas City, Kans.	13,204	32,930b
Royal Oak, Mich.	83,657	293,889e
Virginia, Minn.	8,636	19,862
Boonville, Mo.	126,720	180,000
St. Louis, Mo.	4,577	20,037b
Englewood, N. J.	19,400	....
Enid, Okla.	1,580	4,336
Clintonville, Wis.	10,000	25,500
Merrill, Wis.	39,677	91,124g
South Milwaukee, Wis.	8,000	25,000g
Two Rivers, Wis.	15,000	68,000e
AMIESITE		
New Britain, Conn.	4,961	21,844u
Wilmington, Del.	1,850	3.71su
Webb City, Mo.	28,570	1.4s
Muskogee, Okla.	6,000	5,000
Franklin, Pa.	1,800	3,200p
Hazleton, Pa.	16,164	87,893
Mt. Carmel, Pa.	2,600	14,500e
New Castle Pa.	5,815	9,899q
Elkins, W. Va.	1 block	....
ASPHALT BLOCK		
Bristol, Conn.	3,000	....
Fitchburg, Mass.	1,533	6,000
South Orange, N. J.	30,000	....
Elmira, N. Y.	348	....
New York, N. Y.	5,624	38,939m
Rye, N. Y.	1,145	3,550g
Ashland, O.	12,024	69,712i
Urbana, O.	11,000	42,000e
WILLITE		
St. Louis, Mo.	54,055	304,348b
Rochester, N. Y.	240,234	441,696b
Oklahoma City, Okla.	25,000	125,000r
Tulsa, Okla.	24,703	118,222
Connellsville, Pa.	7,632	29,671p
Washington, Pa.	14,000	60,000a
Amarillo, Tex.	63,714	....
Dallas, Tex.	275,573	1,040,064e

a—Entire improvement. b—Entire paving job. c—Wearing course only. d—Wearing course and base. e—Pavement, grading and curb. f—Includes grading for thickness of pavement. g—Pavement and grading. h—Pavement, curb and gutter, grading, drainage, sidewalks at street intersections. i—Pavement, curb and gutter, grading, storm sewers, engineering, etc. j—Pavement, curb and gutter grading, drainage and adjustments. k—Pavement, grading, storm sewer connections. l—Pavement, grading, curb, catchbasins, inspection, engineering, attorney's fees and advertising. m—Pavement, grading, curb, sidewalks, basins, inlets, etc. n—Resurfacing, with all incidental work. p—Resurfacing, adjusting old brick base and resetting curb. q—Resurfacing on asphalt block. r—Includes grading and drainage. s—Per square yard. t—Includes pavement, curb and gutter and sidewalks. u—Includes grading and resetting curb. v—Includes grading, curb and gutter, manholes, intakes, storm sewers, engineering and inspection.

In addition to the special kinds of pavements tabulated, there were a number of kinds, each reported by only one or two cities. These are given below:

Wood block—New York, N. Y., 270 square yards, $5,302m.

Cinders—Anderson, Ind., 1017 square yards, $664.

Waterbound clay-gravel—Newport News, Va., 28,493 sq. yds., $15,203.

Cinders and oil—Great Falls, Mont., 179,200 square yards, $5,700.

Emulsified Asphalt—Bluffton, Ind., 13,200 square yards, $15,840.

Kyrock—Hastings, N. Y., 700 square yards, $12,000; Ithaca, N. Y.—10,300 square yards, $15,450n.

Warrenite-asbestos—Des Moines, Ia., 21,612 square yards, $60,300.

Asbestophalt—Des Moines, Ia., 2,768 square yards, $5,513.

Bessonite—Asheville, N. C., 4,638 square yards, $5,103c.

Durax—Asheville, N. C., 6,612 square yards, $21,158c.

Chert—Florence, Ala., 15,000 square yards, $30,000e.

National—Wallington, N. J., 5,749 square yards, $16,844.

Creosoted wood block—Minneapolis, Minn., 11,289 square yards, $64,694g.

Shell—Houston, Tex., 126,287 square yards.

Top soil—Greenville, S. C., 3 miles.

Flush coated gravel—Pawtucket, R. I., 5.30 miles

Flush coated macadam—Pawtucket, R. I., 1.42 miles.

Stone Block and Brick Pavements Laid in 1925

City and State	STONE BLOCK Amt. Sq. Yds. or Mi.	STONE BLOCK Cost	BRICK Amt. Sq. Yds. or Mi.	BRICK Cost
Alabama:				
Birmingham	......	......	90,165	$347,249h
Arkansas:				
Little Rock	......	......	639	......
Connecticut:				
Derby	......	......	5,250	23,200c
Hartford	1,024	$6,763e	......	......
Delaware:				
Wilmington	3,125	4.31sy	......	......
Florida:				
Lakeland	......	......	180,000	1,120,000f
Orlando	......	......	100,000	240,000f
Illinois:				
Alton	......	......	22,382	88,928l
Bloomington	......	......	20,596	86,493f
Cairo	......	......	700	3,000
Carbondale	......	......	25,160	134,930f
Kewanee	......	......	6,767	27,631j
			4,376k	11,305
Lawrenceville	......	......	6,800	29,361j
Normal	......	......	11,542	53,841f
Rockford	......	......	11,288	55,174j
Waukegan	2,091	13,987d	2,054	11,836d
Indiana:				
Decatur	......	......	7,436	18,994
Fort Wayne	......	......	10,651	68,592f
Iowa:				
Council Bluffs	......	......	6,200	25,443d
Davenport	......	......	2,256	8,169p

City and State	STONE BLOCK Amt. Sq. Yds. or Mi.	STONE BLOCK Cost	BRICK Amt. Sq. Yds. or Mi.	BRICK Cost
Decorah	......	......	1,9721	......
Des Moines	......	......	99,205	298,077
Iowa City	......	......	500	2,800e
Kansas:				
Atchison	......	......	21,436z 2,654a	43,838f 9,269b
Chanute	......	......	8,582	14,7701
Dodge City	......	......	27,034	73,802
Holton	......	......	9,000	3.15s
Independence	......	......	26,300	84,000f
Lawrence	......	......	3,000	8,000
McPherson	......	......	18,500	75,000
Newton	......	......	¾ Mile	......
Parsons	......	......	4,248	2.47sd
Topeka	......	......	.38 Mile	15,723
Wichita	......	......	11,290	48,164m
Kentucky:				
Ashland	......	......	30,430	249,000f
Maine:				
Bangor	800	3,200f	......	......
Portland	29,415	146,317	......	......
Massachusetts:				
Fitchburg	13,000	43,000	......	......
Lowell	28,203	......	......	......
Lynn	2,320	......	......	......
Somerville	1.17 Miles	6.30 & 3.09B	......	......
Michigan:				
Kalamazoo	......	......	3,745	......
Lansing	......	......	25,700	150,000b
Minnesota:				
Minneapolis	7,331	41,367g	72,089	344,016g
Rochester	......	......	6,500	17,523f
South St. Paul	......	......	5,200	22,000b
St. Paul	......	......	40,600	176,770e
Mississippi:				
Laurel	......	......	25,000	87,500d
St. Joseph	......	......	12,547	50,166d
Vicksburg	......	......	65,000	225,000b
Missouri:				
Kansas City	......	......	6,388	16,214d
St. Louis	12,695	88,247b	15,332	101,359b
Nebraska:				
Fairburg	......	......	33,000	125,000b
Lincoln	......	......	3,400	22,950w
New Jersey:				
Belleville	4,950	7.39s	......	......
Newark	14,946	27,550	......	......
Plainfield	141	798f	......	......
Union City	20,000	120,000c	......	......
New York:				
Amsterdam	......	......	3,312	19,158
Hudson	812	5,684	......	......
Ithaca	375	1,875e	4,740	29,400e
Lockport	......	......	21,693	105,612f
Manhattan Boro, NYC.	232,070	2,028,295n	......	......
Poughkeepsie	4,582	44,602d	946	6,111d
Syracuse	......	......	3,320	11,590f
Yonkers	17,237 725C	131,174d 3,770	......	......
North Carolina:				
Asheville	......	......	723	3,049d
Elizabeth City	......	......	2,250	5,000
Greensboro	......	......	10,981	......
Ohio:				
Ashland	......	......	3,216	16,057j
Barberton	......	......	7,500	41,303f
Bellaire	......	......	190	412i
Cambridge	......	......	3,039	4.98s
Cincinnati	28,700 18,500c	156,000c 62,400c	......	......
Circleville	......	......	18,252	59,664
Columbus	4,800	......	34,500	......
Dayton	......	......	75,410	433,913j
Lancaster	......	......	12,179	45,940p
Lima	......	......	15,216	103,267i
Lorain	......	......	4,572	27,640b
Middletown	......	......	1,505	6,772e
Millersburg	......	......	750	2,669d
Mingo Junction	......	......	1,200	14,000
Niles	......	......	7,500	42,356f
Ravenna	......	......	15,287	69,300
Salem	......	......	6,100	28,000
Struthers	......	......	2,400	8,200f
Warren	......	......	10,220	59,775i
Youngstown	......	......	8,980	38,253f
Zanesville	......	......	1,370	7,865f
Oklahoma:				
Ardmore	......	......	3,478	15,520f
Claremore	......	......	1 Mile	......
Oklahoma City	......	......	5,000	30,000x
Ponca City	......	......	49,000	176,400d
Pennsylvania:				
Allentown	......	......	1,240	5,887e
Bradford	......	......	15,390	90,016x
Butler	......	......	22,150	66,500
Carbondale	......	......	18,771	118,000
Clearfield	......	......	3,000	12,000e
Connellsville	......	......	7,207	34,355f
Corry	......	......	23,548	120,440
Duquesne	......	......	12,940	54,449d
Ebensburg	......	......	1,500	16,600f
Ellwood City	......	......	18,000	83,000
Gallitzin	......	......	2,000	12,000f
Greensburg	......	......	4,877 2,928r	21,213e 15,754e
Greenville	......	......	13,000	......
Hazleton	......	......	6,549	46,750
Jeannette	......	......	800	......
Johnstown	......	......	26,110	191,755
Lansford	......	......	1,000	10,000e
Monessen	......	......	20,000	82,000t
Munhall	......	......	15,120	......
New Brighton	......	......	5,750	22,250e
New Castle	......	......	23,264	127,000f
Rankin	......	......	38,000	125,000d
Sewickley	......	......	850	2,550z
Sharon	......	......	2,754	14,409u
Warren	......	......	11,745	66,287b
Washington	......	......	21,000	100,000b
Waynesburg	......	......	200	1,000d
Wilkensburg	......	......	900 ft.	9,048l
Williamsport	......	......	10,001	39,662v
South Carolina:				
Greenville			600	3,000
Texas:				
Amarillo	......	......	6,513	......
Corsicana	......	......	25,000	75,000e
Houston	......	......	29,678	......
Snyder	......	......	8,500	2.05s
Waco	......	......	1,594	5,541
Virginia:				
Lynchburg	......	......	3,688	11,144d
West Virginia:				
Clarksburg	......	......	6,355	45,000f
Fairmont	......	......	2,700	5,730
Wisconsin:				
Appleton	......	......	2776	9,433e
Janesville	......	......	282	......

a—Entire improvement. b—Entire paving job. c—Wearing course only. d—Wearing course and base. e—Wearing course, base and grading. f—Wearing course, base, grading and curb. g—Includes grading. h—Includes grading for thickness of pavement. i—Wearing course, base, drains, catchbasins, curb and gutters. j—Wearing course, base, grading, curbs, storm sewers, engineering, etc. k—Old brick relaid on edge on new concrete base. l—Resurfacing. m—Pavement, grading, curb and gutter, overhead of publication and financing. n—surface, base, grading, curb, sidewalks, basins, inlets, etc. p—Surface, base, grading, curb, engineering, advertising, etc. q—On 8 inch slag base. r—On 7 inch concrete base. s—Per square yard. t—Surface, base and redressing curb. u—Surface, base, grading, engineering and inspection. v—Surface, base, grading and adjustments of street structures. w—Surface, base, grading, curb and sidewalk. x—Surface, base, grading and drainage. y—Surface, base, grading and resetting curb. z—Includes macadam base. A—On 5 inch concrete base. B—$6.30 new blocks; $3.09 old blocks recut; both on concrete base. C—Recut granite.

Rock Asphalt and Bituminous Macadam

City and State	ROCK ASPHALT Amt. Sq. Yds. or Miles	ROCK ASPHALT Cost	BITUMINOUS MACADAM A—Asphalt T—Tar Amount Square Yards or Miles	BITUMINOUS MACADAM Cost
Alabama:				
Anniston	6,000	$12,000d	......	......
Huntsville	......	......	5,000T	......
Arkansas:				
Prescott	200	700	......	......
California:				
Berkeley	......	......	4,811A	$18,100b
Napa	......	......	11,500A	7,250i
Pasadena	......	......	302,466A	168,784g
Redwood City	......	......	31,000A	38,820e
Santa Cruz	......	......	30,555A	75,000
San Rafael	......	......	4,130A	4,770g
Upland	10,000	3,960	......	......
Connecticut:				
Middletown	......	......	1,600A	4,156g
New Haven	......	......	80,000A	119,400b
New London	......	......	9,165A	18,330
Wallingford	......	......	10,000A	19,000
Winsted	......	......	4,444T	27,500
Illinois:				
Cairo	15,000	25,000	......	......
Freeport	......	......	10,000T	16,000e
Rockford	......	......	48,203T	158,682m
Indiana:				
Franklin	7,000	9,800	......	......
Gary	......	......	6,914A	30,705g
Mt. Vernon	1,860	5,827e	......	......
Richmond	......	......	6,895T	31,846j
Kansas:				
Kansas City	18,671	51,121k	......	......
Kentucky:				
Ashland	14,740	85,522e	27,318T	169,261e
Georgetown	75,000	83,000	......	......
Middlesboro	4,898	23,284e	......	......
Maine:				
Portland	......	......	53,488A	92,224
Rockland	......	......	7,660T	10,064e
South Portland	......	......	4,000	2.00s
Maryland:				
Salisbury	......	......	3,000A 30,000T	2,980d 4,500c
Massachusetts:				
Andover	......	......	14,500A	......
Arlington	......	......	5,810A	11,620g
Brockton	......	......	8,500A	16,800g
Brookline	......	......	29,590A 25,597T	24,374n 26,584n
Dracut	......	......	10,560A	26,714
Fall River	......	......	33,969	......
Fitchburg	......	......	18,600A	40,445
Gardner	......	......	14,000T	......
Gloucester	......	......	31,000A	70,000
Greenfield	......	......	17,458A 5,811T	27,746r 15,049t
Lowell	......	......	7,715A	......
Lee	......	......	3,667T	$2.70s
Lynn	......	......	63,894A	......
Melrose	......	......	10,000T	......
New Bedford	......	......	177,840A	329,469g
Newton	......	......	29,272T	51,400
Northampton	......	......	1,965A	2,830g
Northbridge	......	......	½ Mile A	20,000
Saugus	......	......	14,000f	......
Somerville	......	......	0.867 Mile A 0.884 Mile A	2.10sg 1.75su
Southbridge	......	......	1,800T	5,000b
Texas:				
Corsicana	......	......	1,000A	2,780g
Dallas	72,093	279,863e	......	......
Del Rio	48,131	101,075	......	......
Houston	181,986	......	46,323A	......
Pittsburg	......	......	7,000A	165,000g
Vermont:				
Burlington	......	......	6,475A	6,151g
Rutland	22,000	28,600g	......	......
Virginia:				
Harrisonburg	......	......	5,753T	1.08s
Richmond	5,845	7,633	......	......
Staunton	......	......	29,249A	18,000g
Suffolk	......	......	3.02 Miles T	55,200g
West Virginia:				
Princeton	......	......	65,000A	200,000d
Wisconsin:				
Baraboo	......	......	6,000T	8,400
Oshkosh	......	......	1,792A	3,584b

e—entire improvement. b—entire paving job. c—wearing course only. d—wearing course and base. e—wearing course, base, grading and curb.. f—Bermudez top. g—pavement and grading. h—1½ in. Kentucky rock on 6 in. concrete base. i—6 in. rock, two coats of asphalt and screenings; low price because contractor owns quarry. j—includes grading, curbs and walks. k—includes subgrading, base, curb, catchbasins and drain pipe. l—includes excavation, curb, sewer connections, etc. m—includes grading, base, curbs and gutter, manholes, inlets, storm sewer, engineering, inspection. n—labor, material and equipment overhead for resurfacing average depth of 4 in. p—by day labor. r—3 in. top cost 72c; 6 in. top on old gravel, $1.65; 3½ in. top on old macadam $1.39; 6 in. top and 10 in. foundation $2.28. s—per square yard. t—6in. top on old gravel cost $1.91; 6 in. top and 10 in. foundation $2.86. u—reconstruction. v—base, grading, drainage and curb. w—resurfacing on brick.

Waterbound Macadam and Gravel Laid in 1925

City and State	Water Bound Macadam Amt. Sq. Yds. or Miles	Water Bound Macadam Cost	Gravel Amt. Sq. Yds. or Miles	Gravel Cost
Alabama				
Birmingham	14,245	42,912h	......	......
Huntsville	......	......	20,000	....
Arkansas:				
Little Rock	......	......	22,509	....
Prescott	......	......	4½ Blocks	1,000
California:				
Alameda	32,822	41,356	......	......
Los Angeles	......	......	349,237	443,609j
Redwood City	......	......	4,500	3,000
San Rafael	......	......	310	430g
Colorado:				
Denver	329,285	443,990d	......	......
Grand Junction	......	......	71,000	213,000g
Connecticut:				
Danbury	......	......	12,000	18,000
Hartford	56,020	92,000g	......	......
New Britain	7,5301	8,181	......	......
New London	4,300	4,300	......	......
Georgia:				
Brunswick	......	......	1½ Miles	......
Commerce	......	......	2 Miles, 40' wide	......
Idaho:				
Burley	......	......	55,000	8,250g

Stoneham	......	......	121,000A 121,000T	....
Taunton	......	......	44,300	74,070b
Watertown	......	......	10,560A 14,000T	....
Winchester	......	......	12,725A	25,000g
Michigan:				
Marquette	......	......	35,000A	......
Negauna	......	......	22,000A	31,000b
Minnesota:				
St. Paul	......	......	7,150T	8,225g
Mississippi:				
Canton	16,600h	44,800g	......	......
Missouri:				
Jefferson City	......	......	1,600A	3,200c
Kansas City	......	......	117,270A	266,005d
St. Charles	......	......	5,500A 12,300T	14,000d 13,000d
St. Louis	4,573	20,611b	......	......
Sedalia	......	......	3,632A	4,177b
Montana:				
Butte	......	......	46,370A	66,000g
New Hampshire:				
Laconia	......	......	15,677A	1.80s
New Jersey:				
Belleville	......	......	23,799A 5,994T	...... $1.95s
Bergenfield	......	......	36,127T	65,000d
Dunellen	......	......	10,000A	10,600l
Englewood	......	......	34,400A	......
Philipsburg	......	......	700T	1.58s
Prospect Park	......	......	2,850T	3,850
Rutherford	......	......	28,300A	42,329g
Wallington	......	......	19,170A	32,391
New York:				
Amsterdam	......	......	37,320A	84,716g
Hempstead	......	......	6 Miles A	148,775
Oneonta	......	......	7,000T	10,503
Poughkeepsie	......	......	942A	2,988g
Syracuse	......	......	3,200T	17,000
Watertown	......	......	22,607A	34,724g
Yonkers	......	......	1,556A	4,290d
North Carolina:				
Asheville	6,371	17,393c	......	......
Ohio:				
Bucyrus	......	......	610T	......
Cincinnati	......	......	3,400T	8,600
Elyria	......	......	17,000A	18,144g
Oklahoma:				
Oklahoma City	30,000	150,000v	......	......
Pennsylvania:				
Bradford	2,834	......	......	......
Chambersburg	......	......	14,730A	10,695g
Duquesne	......	......	10,000T	......
Hazleton	......	......	95,135T	10,736
Huntingdon	......	......	10,000T	......
Jersey Shore	......	......	7,455T	......
Lansford	......	......	2,000T	5,000g
Lehighton	......	......	2,772A	$1.76s
Mechanicsburg	......	......	2,200A	2,500u
New Brighton	19,460	22,820g	......	......
Norristown	1,000	1,500	3,000T	4,500
Northampton	......	......	6,800T	......
Sewickley	1,250	1,687w	1,400A	1,750g
Towanda	......	......	2 Miles T	13,000g
Rhode Island:				
Pawtucket	......	......	6,307	......
Woonsocket	......	......	151,500A	......
South Carolina:				
Greenwood	800	750	......	......
Tennessee:				
Clarksville	5,100	13,308g	......	......

Illinois:				
Oblong	18,000	......	......	......
Metropolis	......	......	4 Miles	......
Indiana:				
Franklin	......	......	3,000	3,324
Frankfort	......	......	12,000	3,000
Gary	35,853	124,419g	......	......
Jeffersonville	1,680	7,000	......	......
Muncie	......	......	18,000	6,918
Rensselaer	9 mi.	15,000	......	......
W. Lafayette	......	......	2,200	3,700
Winchester	1,333	......	......	......
Iowa:				
Des Moines	19,926	33,603	......	......
Kansas:				
Manhattan	......	......	1,179	1,087
Kentucky:				
Georgetown	7 mi.	......	......	......
Lexington	24,000	35,000	......	......
Louisiana:				
Minden	......	......	28,000	16,000
Thibodaux	......	......	6,400	3,840
Maine:				
Augusta	......	......	0.8 mile	7,820g
Bangor	......	......	1 Mile	5,000
Portland	......	......	25,191	......
Waterville	......	......	10,000	......
Massachusetts				
Andover	......	......	2,000	......
Brockton	......	......	9,400	6,105g
Gardner	......	......	50,000	......
Gloucester	......	......	1 Mile	4,000
Greenfield	......	......	4.5 Miles	......
Lowell	23,000	......	3,000	......
New Bedford	......	......	26,806	13,688k
Newton	......	......	24,000	......
Northampton	......	......	2,300	2,700
Orange	......	......	2 Miles	11,000
Saugus	......	......	30,000	......
Stoneham	......	......	300,000	......
Watertown	......	......	½ Mile	......
Winchester	......	......	14,500	7,700
Michigan				
Hastings	......	......	23,466	2,460
Niles	......	......	10,000e	......
Royal Oak	......	......	4,711	2,398
Sault Ste. Marie	......	......	2,400	4,000
Minnesota:				
Cloquet	......	......	32,190	3,820
Crookston	......	......	67,000	10,000
Duluth	......	......	15,539	8,696
New Ulm	......	......	2,800	559f
Montevideo	......	......	8,000	1,200
Rochester	......	......	12,000	4,360g
Missouri:				
Caruthersville	......	......	10,000	15,000c
Montana:				
Billings	5,000	2,622	......	......
Bozeman	......	......	4,515	2,600i
Kalispell	......	......	3,000	3,000
Nebraska:				
Blair	......	......	600 ft.	......
New Hampshire:				
Portsmouth	......	......	18,000	3,000j
New Jersey:				
Prospect Park	4,000	3,500	......	......
Vineland	......	......	2.4 Miles	......
New York:				
Amsterdam	10,220	......	......	......
Glens Falls	4,000	......	......	......
Hastings-on-Hudson	5,000	7,500	......	......
Herkimer	......	......	20,000	11,000
Ithaca	......	......	3,000	3,000
Watertown	1,930	1,307	......	......

Black Base Pavements

City	Kind of Wearing Surface	Date
Alabama:		
Florence	Sheet & rock asphalt	1924-1925
Selma	Bit. conc., small aggregate	1910
Arizona:		
Tucson	Asphalt conc. & War.-bit.	....
Arkansas:		
Fayetteville	1½" asphalt concrete	....
California:		
Berkeley	Asphalt concrete	1909
Chico	Asphalt concrete	....
Long Beach	Asphalt concrete	1907-1925
Los Angeles	Sheet asphalt or Warrenite	Various
Modisto	Warrenite-bit.	1919 to date
Napa	Bituminous concrete	1912
Orange	Willite	1922
Orland	Warrenite-bit.	....
San Mateo	Sheet asphalt	1916
San Rafael	1½" asphalt concrete	1924-1925
Santa Ana	Asphalt concrete	1921 to date
Santa Cruz	....	1915
Upland	Sheet asphalt	1912-1924
Visalia	Sheet asph., War. & Topeka	From 1894
Colorado:		
Denver	Asphalt concrete	1921-1925
Connecticut:		
Bridgeport	Warrenite-bit.	1920
Idaho:		
Boise	Asphalt conc. & Warrenite	1916-1922
Indiana:		
Gary	Sheet asphalt	1925
Huntington	Sheet asphalt	1923
La Porte	Sheet asphalt	1924
Richmond	Sheet asphalt	1923
Iowa:		
Clinton	2" Warrenite-bit.	1921-1922
Kentucky:		
Owensboro	Bit. concrete	1918
Massachusetts:		
Brockton	Willite	1920
Lowell	Asphalt concrete	1924-1925
Newton	Tar macadam	1925
Michigan:		
Highland Park	Asphalt	1924
Marquette	Asphalt macadam	1924
Pontiac	Willite	1920-1921
Minnesota:		
Duluth	Tar macadam	1908
Minneapolis	Brick	1917
Montana:		
Billings	Warrenite-bit.	1925
Bozeman	Bitulithic	1921
Great Falls	Warrenite-bit.	1922
Montana (Continued)		
Helena	Warrenite-bit.	1923-1925
Kalispell	Asph. mac. & Warren.-bit.	1913-1923
Lewistown	Bitulithic	1915
Nebraska:		
Lincoln	Asphalt concrete	1923
Omaha	Asphalt	1885-1895
New Jersey:		
Belleville	Sheet asphalt	1923
Newark	1½" sheet asphalt	1924
Rutherford	2½" asphalt macadam	1921-1925
South Orange	Asphalt block & National	1921
New Mexico:		
Albuquerque	Warrenite-bit.	1920-1925
New York:		
Cortland	Topeka	....
Geneva	Bitulithic	1918
North Carolina:		
Mount Airy	Rock asphalt	1924
Wilmington	1½" sheet asphalt	1921
North Dakota:		
Fargo	Bitulithic	1924
Ohio:		
Columbus	Sheet asphalt	1902, '08 & '25
Orville	Sheet asphalt	1925
Oklahoma:		
Ardmore	Sheet asphalt	1915
Muskogee	Asphalt	1921-1925
Oklahoma City	Sheet asphalt	1923-1924
Ponca City	Brick	1925
Oregon:		
Astoria	2" asphalt concrete	1912-1920
Corvallis	Bituminous	1910-1922
Eugene	Asph. conc. & sheet apsh.	1912-1916
La Grande	Gravel bitulithic	1913
Medford	Sheet asphalt	1911-1912
Oregon City	2" asphalt	1915-1925
Portland	Asphalt concrete	Each year
Salem	Topeka	1916-1921
Pennsylvania:		
Altoona	Warrenite-bit.	1924-1925
Berwick	Amiesite	1916
Duquesne	2" asphalt concrete	1925
Mahanoy	Bituminous	1925
Waynesburg	2" Willite	1924
South Carolina:		
Chester	Sheet asphalt	1920
Greenville	Asphalt concrete	1924
Tennessee:		
Jackson	Sheet asphalt	1921
Johnson City	Asphalt concrete	1924
Texas:		
Dallas	Bitulithic	1907
El Paso	Warrenite-bit.	1923
Waco	Warrenite-bit. & asph. conc	1924-1925

City and State	Gravel Amt. Sq. Yds. or Miles	Gravel Cost	Water Bound Macadam Amt. Sq. Yds. or Miles	Water Bound Macadam Cost
North Carolina:				
Elizabeth City	......	......	5,000	2,000
North Dakota:				
Jamestown	......	......	3,400	2,550
Ohio:				
Bellefontain	......	......	......	......
Dayton	......	......	600	500
Napoleon	1,387	1,500	1,327	7,806
Urbana	......	......	4,000	2,500
Wooster	2,000	......	......	......
Oklahoma:				
Muskogee	......	......	10,800	10,800
Oklahoma City	......	......	10,000	25,000
Wagoner	......	......	25,000	40,000
Oregon:				
Ashland	3,000	2,000	......	......
Astoria	1,110	3,510j	......	......
Corvallis	......	......	20,000	......
La Grande	2,436	7,839	......	......
Oregon City	1,000	700	......	......
Portland	5,201	......	......	......
Pennsylvania:				
Chambersburg	1,000	650	......	......
Easton	8,678	3,104	......	......
Hazleton	......	......	95,158	47,593
Jersey Shore	7,583	......	16,922	......
Shippensburg	3,800	2.25g	......	......
Rhode Island:				
Pawtucket	......	......	1.82	......
South Carolina:				
Chester	......	......	2,080	191
South Dakota:				
Rapid City	......	......	2 Miles	660
Watertown	......	......	5 Miles	......
Yankton	......	......	3,440	1,000
Tennessee:				
Jackson	......	......	3,000	4,000
Texas:				
Amarillo	......	......	50,056	......
Brownwood	8,667	8,000g	20,000	7,500g
Corsicana	......	......	10,000	10,000
Dallas	16,517	17,420	......	......
Houston	......	......	199,010	......
Mineral Wells	......	......	10,000	......
Utah:				
Logan	......	......	7,000	......
Salt Lake City	......	......	30 Miles	270,000
Vermont:				
Burlington	......	......	12,765	6,382
Newport	......	......	1,200 lin. ft.	1,800
Rutland	......	......	40,000	12,000
St. Albans	......	......	0.75 Miles	337
Virginia:				
Fredericksburg	......	......	16,000	4,500
Lynchburg	30,000	30,000	......	......
Richmond	......	......	239,357e	30,315
Washington:				
Port Angeles	......	......	20,000	104,000
Yakima	......	......	2,815	2,173
West Virginia:				
Fairmont	1,700	2,200	......	......
Wisconsin:				
Eau Claire	......	......	130,000	6,100
Lake Geneva	......	......	3,000	3,000
Ripon	3,000	......	8,000	......
Wyoming:				
Cheyenne	......	......	45 Miles	......

a—Entire improvement. b—entire paving job. c—pavement, grading and curb. d—pavement, grading, curb, collection, interest on deferred payments, etc. e—resurfacing. f—$1.20 per cubic yard. g—includes grading. h—includes grading for thickness of pavement. i—includes grading, engineering and incidentals. j—with oil. k—with two coats of oil. total three-quarter gallon. l—7-inch base for future 3-inch penetration.

Black Base Pavements

City	Kind of Wearing Surface	Date
Utah:		
Salt Lake City...	2" bituminous concrete	1922
Vermont:		
Burlington	Stone-filled sheet asphalt	1925
Washington:		
Colfax	Asphalt	1911
Puyallup	Warrenite	1920-1922
Walla Walla.....	1½" asphalt concrete	1913-1923
Wenatchee	Warrenite	1923-1924
Yakima	Bitulithic	....
West Virginia:		
Moundsville	Asphalt concrete	1925
Princeton	2" Topeka top	1924-1925
Wisconsin:		
Oshkosh	Tar macadam	1904-1910
Wyoming:		
Sheridan	Warrenite-bit.	1921-1923

Cement Sidewalks in 1925

City and State	Amount sq. ft. or miles	Cost
Alabama:		
Anniston	90,000	$15,000
Birmingham	586,746	100,910
Montgomery	52,100	9,064
Selma	45,000	8,000
Arkansas:		
Fayetteville	20,000	5,000
Ft. Smith	26,000	....
Prescott	3,0001	3,000
Arizona:		
Tucson	47,500	17,220
California:		
Alameda	59,500	13,100
Berkeley	160,000	32,000
Chico	281,330	41,636
Long Beach	638,694	108,728
Los Angeles	7,759,184	1,646,260g
Manhattan Beach	56,463	12,302
Pasadena	542,601	92,205
Redwood City	54,000	10,800
Sacramento	218,618c	46,095
San Diego	510,842	104,657
San Rafael	3,600	680
Visalia	144,621	46,536d
Colorado:		
Colorado Springs	149,000	23,840
Denver	607,230	....
Grand Junction	119,063	18,202
Greeley	12,000	2,400
La Junta	14,085	2,394
Monte Vista	2,500	750
Pueblo	11,000	2,400
Connecticut:		
Bristol	26,620	6,254
Hartford	290,000	116,000
Meriden	26,400	11,800
Putnam	10,000	2,500
New London	37,000	9,780
Florida:		
Fernandina	1,800	360
Lakeland	500,000	100,000
Ocala	45,000	9,000
Georgia:		
Cartersville	5 mi.	25,000
Milledgeville	8,520	1,533
Idaho:		
Burley	4,000	660
Illinois:		
Alton	32,400	7,128
Bloomington	12 mi.	....
Cicero	47,865	....
Clinton	9,000	2,500
Edwardsville	17,000	3,300
Harrisburg	107,772	22,160
Kankakee	5,000	....
Kewanee	4,967	1,410
Lake Forest	12,6251	18,433
Macomb	30 blocks	....
Mt. Carmel	1 mi.	....
Normal	20,000	4,400
Winnetka	165,000	41,000
Indiana:		
Anderson	86,288	28,093
Attica	6,500	1,300
Connersville	4,400	880
Decatur	16,858	3,372
Elkhart	53,886	13,567
Fort Wayne	23.73 mi.	126,159
Frankfort	55,094	11,534
Jeffersonville	16,000	3,200
Muncie	105,066	18,678
Richmond	2.27 mi.	5,913
Seymour	2,000	1,200
Vincennes	81,000	11,261
Washington	19,500	3,510
West Lafayette	7,200	$1.35s
Winchester	2,997	266
Iowa:		
Chariton	20,000	2,200
Council Bluffs	157,922	28,394
Davenport	250,000	46,000
Iowa (Continued)		
Des Moines	446,048	70,852
Oelwein	10,000	2,000
Sioux City	7.95 mi.	30,240
Waterloo	10,2001	....
Kansas:		
Independence	1,0001	....
Manhattan	10,458	4,614
Newton	⅛ mi.	....
Parsons	10,800	1,836g
Topeka	7.35 mi.	....
Kentucky:		
Ashland	20,0001	20,000
Louisiana:		
Minden	80,000	16,000
Maine:		
Augusta	39,501	4,439
Bangor	17,100	4,000
South Portland	18,000	$1.80s
Waterville	500	....
Maryland:		
Crisfield	1 mi.	....
Salisbury	6,030	1,200
Massachusetts:		
Adams	24,322	6,500
Andover	7,800	....
Arlington	33,300	11,100
Brookline	39,600	5,500
Fall River	43,818	....
Gardner	70,200	....
Gloucester	13,500	4,000
Greenfield	14,200h	16,850
Lee	9,900	2,475
Lynn	130,986	2.30s
New Bedford	538,200	208,870
Newton	125,804	36,657
North Adams	34,011	10,604
Northampton	35,100	8,000
Orange	18,000	4,300
Pittsfield	51,237	2.47s
Saugus	2,300	....
Somerville	1,027 mi.	3.40s
Southbridge	22,500	10,500
Winchester	40,500	12,500
Michigan:		
Albion	24,000	5,000
Bay City	12,840	2,207
Dowagiac	32,282	4,028e
Hamtramck	12,0001	.22f
Hastings	19,600	1,960
Highland Park	118,000	....
Holland	36,000	4,300
Ironwood	9,000	1,972
Ludington	15,000	....
Marquette	6,000	....
Mt. Pleasant	1,0001	650
Negauna	15,000	2,400
Niles	20,000	1.44r
Owosso	66,428	....
Pontiac	25,000	....
Royal Oak	413,592	74,757
Minnesota:		
Brainerd	4,986	1,098a
Cloquet	28,655	3,725
Duluth	391,603	102,943
Fairmont	6,300	1,050
Faribault	1,0001	....
Mankato	20,000	2,500
New Ulm	50,166	5,239
Rochester	6,500	....
St. Cloud	95,787	10,643
St. Paul	28.4 mi.	126,900
South St. Paul	195,000	25,608
Virginia	4,000	1,600
Mississippi:		
Canton	7,6001	5,700
Columbus	9,000	1,500
Laurel	27,000	4,950
Missouri:		
Joplin	46,400	12,381
Kansas City	283,595	51,123
St. Charles	13,500	1,875
Sedalia	2 miles	5,500
Webb City	....	800
Montana:		
Billings	2,622	655
Bozeman	14,220	5,066
Kalispell	8,660	1,987
Missoula	40,103	16,641
Nebraska:		
Grand Island	25,000	3,500
Havelock	12,000	2,400
Lincoln	75,606	65,772
New Hampshire:		
Keene	30,600	5,485
New Jersey:		
Belleville	229,894	0.22f
Bergenfield	148,100	51,835
Plainfield	15,282	14,516
Somerville	4,000	0.38f
Englewood	18,3001	....
South Orange	80,000	....
Union City	200,000	50,000
Vineland	63,400	12,680
Wallington	40,072	10,125

Cement Sidewalks in 1925

City and State	Amount sq. ft. or miles	Cost
New Mexico:		
Albuquerque	4,377	....
New York:		
Corning	23,275	5,453
Elmira	41,118	9,554
Gloversville	4,653	1,012
Herkimer	1,000	250
Ithaca	2,700	600
Lancaster	16,256	4,064
Lynbrook	40,500	10,000
Oneonta	2,700	810
Perry	3,200	640
Poughkeepsie	9,675	2,683
Rockville Centre	3 miles	0.19-0.25f
Rye	....	18,796
Solvay	10,200	2,040
Tarrytown	7,000	....
Tonawanda	25,000	18,000
North Carolina:		
Durham	74,700	14,000
Greensboro	20,000	....
Mount Airy	17,100	....
North Dakota:		
Jamestown	6,600	1,520
Ohio:		
Ashtabula	50,000	10,000
Bellefontaine	3,300	525
Cincinnati	340,000	100,000
Columbus	190,800	48,000
Dayton	215,000	43,000
Delaware	7,000	0.22f
Elyria	1,386 / 15,431b	2,700
Hillsboro	5001	....
Kenmore	18,300	3,500
Lorain	2,000	400
Massillon	53,251	31,900
Newark	4,022	3,016
Niles	12,000	2,040
Ravenna	9,000	....
Sandusky	100,965	25,241
Troy	1,000	0.15f
Urbana	50,000	10,000
Warren	55,8351	....
Wooster	4,5001	....
Youngstown	8,000	1,600
Oklahoma:		
Altus	0.75 mile	....
Ardmore	10,675	1,680
Claremore	10 miles	11,500
Muskogee	35,000	5,000
Oklahoma City	75,000	10,500
Ponca City	10,000	2,500
Tulsa	48,394	9,597
Wagoner	5,000	600
Oregon:		
Ashland	27,000	5,500
Astoria	32,221	8,146
Eugene	150,000	27,000
La Grande	57,807	11,048
Oregon City	51,000	8,160
Salem	185,000	24,050
Pennsylvania:		
Berwick	43,500	.15f
Bradford	40,000	10,000
Clearfield	1,200	2.00s
College Hill	15,300	1.98s
Corry	14,670	3,260
Du Bois	8,460	....
Duquesne	5,054	1,847
Dunmore	10,000	4,000
Ellwood City	1¼ mi.	7,300
Freeland	4,500	2,000
Greenville	18,000	....
Grove City	10,000	3,000
Huntingdon	18,000	....
Jersey Shore	5,000	900
Kingston	100,000	30,000
Lansford	20,000	8,000
Munhall	11,591	2,471
New Brighton	3,0001	....
Palmerton	3,600	1,200
Punxsutawney	9,000	....
Rankin	4,050	1,300
Sharon	73,000	16,000
Waynesburg	9,000	3,850
West Hazleton	26,379	....
Williamsport	75,000	....
Wilkinsburg	18,000	5,400
Rhode Island:		
Woonsocket	21,150 / 245,7001	17,050 / 40,950
South Carolina:		
Charleston	....	130,000
Chester	792	197
Greenville	10,800	1,800
Orangeburg	2,732	3,988
Union	9,000	2,200
South Dakota:		
Huron	2 miles	8,876
Mitchell	2,800	4,745
Rapid City	16,842j / 2,043k	3,965 / 817
Tennessee:		
Alcoa	35,676	7,492
Jackson	5,000	1,000
Texas:		
Brownwood	23,200	3,712
Corsicana	90,000	18,000
Dallas	948,915	189,000
El Paso	42,000	5,040
Navasota	10,000	....
San Benito	15,000	3,000
Utah:		
Provo	65,000	11,500
Salt Lake City	2.456 mi.	....
Vermont:		
Bennington	30,000	6,480
Burlington	81,000	16,200
Rutland	3 miles	....
St. Albans	....	13,361
Virginia:		
Harrisonburg	22,206	0.149f
Lynchburg	59,265	13,170
Staunton	11,700	2,400
Suffolk	1.6 mi.	....
Washington:		
Everett	61,310	....
Wenatchee	9,000	$1.75s
Yakima	26,892	8,068
West Virginia:		
Clarksburg	36,000	9,000
Elkins	About 4 blocks	....
Morgantown	8,2961	....
Wisconsin:		
Antigo	5,000	0.16f
Appleton	86,800	15,645
Beloit	12,600	1,512
Clintonville	1,0001	800
Eau Claire	21,150	2,405
Kaukauna	2,500	....
Kenosha	115,008	19,373
Lake Geneva	2,000	400
Marshfield	2½ mi.	0.14 to .17f
Merrill	48,000	4,800
Oshkosh	3 miles	....
South Milwaukee	60,000	13,200
Superior	63,701	12,085
Wyoming:		
Cheyenne	7,200	....

a—Includes heavy excavating. b—Stone sidewalks. c—Private contracts not included. d—Includes 40,985 ft. of curb. e—Concrete work only. f—Per square foot. g—Includes grading. h—Cubic feet. i—Tar concrete sidewalks. j—6" thick. k—7" thick. l—Lineal feet. s—Per square yard.

Quick Hardening Cements

Unless otherwise stated, the cement used was "lumnite." The purpose for which the cement was used, when reported, is given in parenthesis.

California: San Rafael (patches), Santa Ana (patches).
Connecticut: Bristol, Hartford, New Britain, New London, Willimantic.
Delaware: Wilmington (over ditches).
Florida: Jacksonville (repairs).
Georgia: Milledgeville.
Illinois: Centralia, Clinton, Granite City (repairs).
Indiana: Lebannon (repairs).
Iowa: Iowa City (repairs).
Kansas: Wichita.
Kentucky: Ludlow (calcium chloride).
Maine: Bangor, Portland, Waterville (patches).
Massachusetts: Adams (patching), Brockton, Brookline, Fitchburg, Gardner, Greenfield (patches), Lowell (patches), Orange.
Michigan: Ann Arbor, Coldwater (patching—too expensive), Lansing, Pontiac.
Minnesota: Mankato (repairs), St. Cloud (patches).
Missouri: Boonville, Cape Girardeau (repairs), Hannibal (repairs), St. Charles (maintenance), St. Joseph (emergency), St. Louis, Sedalia (repairs).
Nebraska: Grand Island (repairs).
New Jersey: Belleville, Carteret, Flemington (3% calcium chloride in concrete pavement), Irvington (cold weather repairs), Newark, Somerville, South Orange, Vineland (patches and repairs).
New York: Cortland, Elmira, Glens Falls (in cutting back corners), Herkimer, Hudson, Massena, Manhattan Boro., Poughkeepsie, Scotia.
North Carolina: Mount Airy, Wilson (patching).
North Dakota: Fargo (repairs).
Ohio: Ashland (repairs), Ashtabula, Cincinnati (repairs), Columbus, Cuyahoga Falls (repairs), Dayton (emergency), Elyria, Lakewood (repairs), Massillon, Wooster. (Continued on page 72)

CONCRETE PAVEMENT LAID IN 1925

City and State	Reinforced Concrete: Amount sq. yds. or miles	Reinforced Concrete: Cost	Reinforced Concrete: Reinforcement Wt. per 100 sq. ft.	Not Reinforced: Amount sq. yds. or miles	Not Reinforced: Cost
Alabama:					
Birmingham	......	......	......	76,306	$164,873h
Selma	......	......	......	200,000	425,000g
Troy	97,314	......	32 lb. fabric	......	......
Arkansas:					
Fayetteville	10,000	23,000	40 lbs.	3,000	6,000
Little Rock	25,094	......	......	......	......
Texarkana	......	......	......	20,000	2.25s
California:					
Berkeley	......	......	......	21,367	105,084a
Long Beach	......	......	......	120,088	300,185g
Los Angeles	......	......	......	1,302,370	3,221,705c
Manhattan Beach	......	......	......	47,483	91,670l
Pasadena	......	......	......	15,266	28,970g
Redwood City	......	......	......	16,673	32,927l
Sacramento	......	......	......	102,883	229,229
San Diego	......	......	......	184,072	319,672
San Rafael	......	......	......	6,940	15,620g
Santa Ana	......	......	......	201,946	429,823f
Santa Cruz	......	......	......	86,100	175,000
Colorado:					
Denver	......	......	......	209,455A	435,138n
Grand Junction	......	......	......	748	2,100e
Pueblo	......	......	......	2,500	13,500f
Connecticut:					
Bristol	......	......	......	2,810	10,000g
Hartford	5,716	22,008g	110 lbs. bars	3,411	11,592g
New Haven	......	......	......	10,200	11,100a
New Britain	5,390	22,141	Marginal bars	......	......
Illinois:					
Alton	12,730	47,256l	40 lb. fabric	......	......
Batavia	20,000	2.33cs	......	......	......
Bloomington	22,040	74,223l	40 lb. fabric	......	......
Cairo	1,300	3,900	......	......	......
Calumet City	25,000	100,000	48 lb.	......	......
Canton	90,000	250,000	......	......	......
Carbondale	2,189	7,443l	40 lb.	......	......
Centralia	8,902	3.79js	45 lbs. bars	......	......
Champaign	60,000	296,000d	......	......	......
Cicero	28,378	......	50 lbs. fabric	78,000	......
Clinton	500	1,250m	......	......	......
De Kalb	⅝ mi.	35,500f	40 lbs. mesh[k]	......	......
Dixon	......	......	......	7,000	18,000l
Edwardsville	12,650	34,000	......	......	......
Harrisburg	15,427	60,000	......	......	......
Kankakee	18,000	49,658	......	......	......
Kewanee	8,003	25,029p	57 lbs. fabric	......	......
Lawrenceville	......	......	43.8 lbs. fabric	......	......
Metropolis	27 mi.	610,000	......	......	......
Oblong	32,000	85,000q	42 lbs. fabric	......	......
Pana	5,747	16,379c	......	......	......
Rockford	32,422	111,474	78.4 & 48.8 lb.	......	......
St. Joseph	11,550	42,000l	......	......	......
Sycamore	3,500	11,000c	......	......	......
Waukegan	98,077	415,000c	......	......	......
Winnetka	165,000	810,000	......	......	......
Indiana:					
Anderson	......	......	......	17,436	44,636b
Attica	......	......	......	1,700	6,800
Connersville	......	......	......	18,000	40,000b
Elkhart	......	......	......	31,329	64,677b
Fort Wayne	2,478	9,302l	......	54,784	123,141l
Franklin	......	......	......	7,650	19,050c
Frankfort	......	......	50 lbs. fabric	......	......
Gary	24,988	117,207l	34 lbs.	29,898A	87,213g
La Porte	4,792	23,407b	40 lb. bars for 24′ width	......	......
Lebanon	......	......	50 lbs. fabric	......	......
Logansport	......	......	......	25,000	59,000l
Michigan City	10,700	42,000	fabric	......	......
Muncie	......	......	......	19,521	49,640
Portland	7,700	......	......	......	......
Richmond	3,936	10,072c	51 lbs.	......	......
Rushville	......	40,000	fabric	......	......
Seymour	......	......	......	1,000	3,000
Vincennes	......	......	......	20,000	68,807v
W. Lafayette	1,500	3,900l	......	......	......
Winchester	......	......	......	3,555	8,887g
Iowa:					
Ames	......	......	50 lbs. bars	......	......
Charles City	10,832	23,493g	25 lbs. mesh	......	......
Council Bluffs	......	......	......	49,281	108,058t
Creston	30,000	96,000l	......	......	......
Davenport	5,963	16,897u	40 lbs. fabric	44,749	81,505g
Decorah	19,172	45,347h	30 to 45 lbs. fabric	......	......
Des Moines	......	......	......	31,216	66,362
Iowa City	25,000	70,000u	40 lbs. bars	......	......
Mechanicsville	25,000	85,000e	35½ lbs. fabric	......	......
Sioux City	19,415	43,112	bars	114,764	235,954
Kansas:					
Atchison	......	......	......	2,920	8,293l
Chanute	......	......	......	14,710	32,910l
Independence	2,000	5,500	40 lb.	3,000	11,000l
Kansas City	......	......	......	39,425	79,309l
Lawrence	......	......	......	25,000	55,000
Manhattan	......	......	......	684	2,067
Parsons	......	......	......	13,404	1.86g
Topeka	0.31 mi.	......	......	3.94 mi.	102,000
Wichita	19,503	53,392u	......	148,682	407,680u
Kentucky:					
Ashland	37,016	175,589	40 lb. fab. & bars	......	......
Corbin	6,000	33,000	40 lbs.	......	......
Banton	1,600	7,000	28 lbs. bars	......	......

City and State	Reinforced Concrete: Amount sq. yds. or miles	Reinforced Concrete: Cost	Reinforcement Wt. per 100 sq. ft.	Not Reinforced: Amount sq. yds. or miles	Not Reinforced: Cost
Ft. Thomas	8,000	20,000c	50 lbs. fabric	......	......
Lexington	15,700	52,5001	40 lb. fabric	......	......
Ludlow	5,600	2.27sc	......	......	......
Middlesboro	25,069	114,4991	28 lb.	......	......
Mt. Sterling	26,300	66,000p	36 lbs. fabric	......	......
Louisiana:					
Minden	85,000	240,000	......	......	......
Maine:					
Bangor	20,000	52,0001m	85 lbs. bars	......	......
Waterville	8,000	29,300	......	......	......
Maryland:					
Salisbury	......	......	......	2,100	5,544c
Massachusetts:					
Adams	8,536	28,000g	......	......	......
Arlington	14,100	56,400g	......	5,100	16,575g
Brockton	24,300	74,400g	......	12,700	39,500g
Gardner	5,800	......	......	......	......
Great Barrington	4,034	11,900	......	......	......
Greenfield	880	5,076f	......	......	......
Lowell	15,174.2	......	......	......	......
North Adams	6,462	15,409c	165 lb.	......	......
Northampton	2,477	8,121g	......	......	......
Northbridge	¾ mi.	30,000	......	......	......
Orange	200	6,000	......	......	......
Pittsfield	16,959	2.20c 2.80g	54-100 lb.	......	......
Southbridge	1,500	10,000	......	......	......
Michigan:					
Albion	7,950	20,800g	......	......	......
Alma	......	......	......	5,000	10,145
Ann Arbor	......	......	......	2,393	7,436
Bay City	......	......	......	3,362	12,283
Coldwater	5,100	10,200c	......	......	......
Dowagiac	......	......	......	3,971	6,978c
Grand Haven	......	......	......	18,000	33,120
Hamtramck	......	......	......	53,000	132,000
Hastings	......	......	......	1,380	2,840
Highland Park	13,428	52,916p	162 lbs. rods	58,589	150,529c
Ironwood	......	......	......	2,000	5,000c
Kalamazoo	......	......	......	351	......
Lansing	......	......	......	4,600	11,0001
Mt. Pleasant	......	......	......	4,700	7,800g
Muskegon Heights	......	......	......	24,001	89,189v
Niles	......	......	......	10,600	23,850a
Owosso	......	......	......	8,421	......
Pontiac	4,000	......	43 lbs. fabric	......	......
Port Huron	70.513	282,7121	43 lbs. fabric	......	......
Minnesota:					
Bemidji	......	......	......	9,155	31,595
Brainerd	4,544	10,906p	35 lbs. bars	......	......
Crookston	10,000	51,118	......	......	......
Duluth	134,860	321,989	......	......	......
Fairmont	2,661	6.717c	60 lbs. bars	......	......
Faribault	25,000	$2.17s	......	......	......
Minneapolis	......	......	......	11,046	34,713g
Owatonna	27,442	78,9891	55 lbs. bars	......	......
Rochester	......	......	......	790	2,6001
South St. Paul	1,400	3,2501	35 lbs fabric	......	......
St. Paul	80,460	158.200g	65 lb. bars	15,150	31,000g
Virginia	6.496	15.265	40 lbs. bars	......	......
Mississippi:					
Canton	......	......	......	6,500	14,300
Vicksburg	......	......	......	12,000	40,000a
Missouri:					
Booneville	......	......	......	1,500	3,5001
Cape Girardeau	......	......	35 lb.	4.5 mi.	1.80sc
Caruthersville	......	......	......	30,000	90,0001
De Soto	......	......	......	12,000	41,000
Hannibal	21,875	72,8721	36 lb. fabric	......	......
Jefferson City	......	......	......	......	6,000
Joplin	......	......	......	19,840	35,174g
Kansas City	......	......	......	185,954	461,627c
Kirksville	10,000	26,213	40 lb. fabric	......	......
Neosho	......	......	......	30,311	81,848
St. Joseph	......	......	......	91,508	208,826c
St. Louis	19,254	90.411a	Fabric & bars	108,536	288,540a
Sedalia	......	......	......	105,987	222,419a
Webb City	......	......	......	20,000	......
Montana:					
Great Falls	770	1.832g	40 lbs.	4,420	9.261g
Kalispell	667	2.2021	......	......	......
Nebraska:					
Fremont	22,000	41,800g	......	......	......
Hastings	6,460	15,672c	28 lb. fabric	......	......
Lincoln	......	......	......	5,806	15,016f
Omaha	22,004	35.795c	......	......	......
Scotts Bluff	......	......	......	6.000	13,716r
New Hampshire:					
Keene	6,000	18.982	......	......	......
New Jersey:					
Belleville	23,037	2.78s	39 lbs. fabric	......	......
Carteret	......	24.000	34 lbs. fabric	......	......
Dunellen	8,000	30,200x	......	......	......
Englewood	......	......	......	100	......
Flemington	1,700-6"	4.250	......	......	......
	1,400-8"	4,340	bars	......	......
Irvington	102.851	264.122c	72 lb. bars	......	......
Newark	1,750	19.7001	......	......	......
Somerville	3,583	3.25s	......	......	......
South Orange	25,000	......	......	......	......
Union City	16,000	48,000c	......	......	......
Wallington	......	......	......	**18**	**54**
New York:					
Amsterdam	27,491	90,386g	48 lbs. fabric	......	......
Batavia	15,480	61,3561	......	......	......
Elmira	6,730	26.323	56 lbs. fabric	......	......
Glens Falls	14,090	42.264w	......	......	......
Gloversville	11,290	27,013	......	......	......
Herkimer	9,200	36,8001	73 lbs. bar	......	......
Hudson	......	......	......	27,875	63,303
Ithaca	7.000	22.400c	mesh	......	......
Lackawanna	16.178	82.580v	42 lb. fabric	......	......
Lancaster	7.839	34,310v	bars	......	......
Lockport	13,720	50,300a	......	......	......

Concrete Pavements Laid in 1925 (Continued)

City and State	Reinforced Concrete: Amount sq. yds. or miles	Reinforced Concrete: Cost	Reinforcement Wt. per 100 sq. ft.	Not Reinforced: Amount sq. yds. or miles	Not Reinforced: Cost
Massena	8,577	30,638l	......	......	......
N. Tonawanda	300	1,200g	......	......	......
Norwich	1,192	4,387g	......	......	......
Oneida	24,177	102,343v	......	......	......
Oneonta	......	......	......	361	1,025
Oswego	7,204	20,000l	40 lb.	......	......
Poughkeepsie	2,679	12,501g	......	......	......
Rochester	27,147	40,025a	40 lb. fab. & bars	......	......
Rye	10,732	78,613g	......	......	......
Saranac Lake	1,632	5,731v	50 lbs. fabric	......	......
Scotia	7,184	18,700g	42 lbs. bar	41,248	107,300g
Seneca Falls	18,300	56,000	54 lbs. mesh, 100 lbs. bar	......	......
Solvay	10,000	22,500c	⅝" edge bar	......	......
Tarrytown	6,000	......	......	......	......
Tonawanda	275,000	1,650,000v	fabric 42 lbs., bars 75 lbs.	......	......
Utica	17,275	5.05s	......	......	......
North Carolina:					
Asheville	......	......	......	57,482	149,656c
Greensboro	......	......	......	4,112	......
Mount Airy	......	......	......	12,000	......
North Dakota:					
Fargo	6,890	27,175l	56 lb. bars	......	......
Grand Forks	18,050	62,700v	62 lb. bars	......	......
Mandan	10,356	44,607q	......	......	......
Ohio:					
Amherst	6,688	24,355a	......	......	......
Ashland	1,031	5,144i	......	......	......
Bellaire	14,605	55,083l	56 lbs. fabric	......	......
Bellefontaine	9,225	23,237l	55	......	......
Cambridge	33,469-8" 2,054-6"	3.92s 3.30s	......	......	......
Cincinnati	113,900	332,000c	25 lb.	1,700	5,000c
Columbus	75,000	......	......	......	......
Conneaut	4,168y	18,823p	56 lbs. fabric	......	......
Dayton	42,803	132,266v	28 lbs. fabric	......	......
Lakewood	1,848	11,212l	56 lbs. fabric	......	......
Lorain	69,331	234,427l	55 lbs. mesh	......	......
Marietta	600	1,200	30 lbs. bars	......	......
Massillon	3,180	12,600g	32 lbs mesh	......	......
Middletown	......	......	......	4,615	14,110g
Millersburg	14,868	37,652g	40 lbs. fabric	......	......
Mingo Junction	......	......	40 lbs. mesh	......	......
Napoleon	6,695	22,649	......	......	......
Newark	......	......	......	95,561	31,362
Niles	3,442	11,896l	......	......	......
Sandusky	1,132 mi.	45,837	......	......	......
Struthers	14,500	60,000l	56 lbs. fabric	......	......
Troy	5,300	2.30sc	......	......	......
Urbana	700	2,000l	60 lbs. bars	......	......
Warren	5,127	25,544i	45 lbs. mesh	......	......
Wooster	......	......	......	8,000	......
Youngstown	87,526	255,891l	57 lbs. fabric	......	......
Zanesville	3,854	10,697g	28 lbs. fabric	......	......
Oklahoma:					
Ardmore	......	......	......	4,300	11,911d
Enid	......	......	......	11,339	28,495
Muskogee	......	......	......	19,953	51,629c
Oklahoma City	......	......	......	28,000	112,000
Ponca City	......	......	......	700	2,100
Tulsa	......	......	......	121,197	771,315
Oregon:					
Astoria	......	......	......	20,692	77,471d
Corvallis	......	......	......	20,000	60,000d
Eugene	......	......	......	200,000	493,000d
Oregon City	......	......	......	25,000	41,250c
Portland	148,017	......	......	......	......
Salem	......	......	......	92,190	181,120
Pennsylvania					
Allentown	2,070	6,004g	25 lbs.	......	......
Altoona	135,020	540,625x	65 lbs.	7,065	26,673x
Chambersburg	400	2,808	48 lbs. fabric	......	......
Clairton	6,068	18,000c	56	......	......
Clearfield	10,000	45,000g	bars	......	......
Du Bois	5,576	25,246l	42 lb. fab. & bars	......	......
Easton	8,047	39,042c	......		......
Ellwood City	600	2,400	......		......
Franklin	13,200	55,527r	⅝" bars	......	......
Frackville	11,417	64,126l	65 lbs. fabric	......	......
Freeland	14,500	66,000	75 lbs. fabric	......	......
Gallitzin	12,000	58,000l	......	......	......
Harrisburg	......	......	......	5,523	15,558g
Huntingdon	10,754	......	65 lbs. fabric	......	......
Johnstown	29,211	122,776l	fabric	......	......
Lansdowne	9,479	28,842g	56 lbs. bars	......	......
Lebanon	13,530	43,628g	37 lbs. mesh	......	......
Mahanoy City	......	......	......	500	2,000l
Monongahela	8,000	29,000l	......	......	......
Mt. Carmel	8,000	40,000l	......	......	......
Mt. Union	2,400	2,040l	......	......	......
Munhall	10,700	56,100l	......	......	......
New Brighton	4,660	16,686g	45 lbs. fabric	......	......
New Castle	451	3,427l	65 lbs. fabric	......	......
Palmerton	7,275	28,000	......	......	......
Punxsutawney	500	......	......	......	......
Sewickley	1,444	4,332g	65 lb.	......	......
Somerset	8100	24,300e	¾" edge bars	......	......
Tyrone	18,892	50,542g	60 lbs. fabric	......	......
Washington	5,300	20,000a	65 lbs. fabric	......	......
Westmont	4,000	12,500g	bars	......	......
Wilkinsburg	300 ft.	2,072	28 lbs fabric	......	......
South Carolina					
Greenville	......	......	......	2,000	5,600
Orangeburg	......	......	......	4,485	10,808
Tennessee					
Jackson	......	......	......	37,500	106,000f
Texas					
Denison	19,562	48,905	......	......	......
Houston	......	......	......	23,261	......
Navasota	25,000	75,000	......	......	......
San Benito	90,000	252,000	bars & dowels	......	......

City and State	Reinforced Concrete: Amount sq. yds. or miles	Reinforced Concrete: Cost	Reinforced Concrete: Reinforcement Wt. per 100 sq. ft.	Not Reinforced: Amount sq. yds. or miles	Not Reinforced: Cost
Utah					
Provo	......	......	......	12,200	35,000l
Salt Lake City	......	......	45 lbs.	538	2,309
Vermont					
Rutland	10,000	19,000g	45 lb. mesh	......	......
St. Albans	1,656y	30,375	......	......	......
Virginia					
Lynchburg	......	......	......	7,100	18,169g
Richmond	......	......	......	5,650	13,896
Suffolk	......	......	......	1.2 mi.	31,000g
Washington					
Everett	......	......	......	59,014	208,351w
Port Angeles	5,140	13,878g	......	844	3,207g
Yakima	......	......	......	16,338	47,867e
West Virginia					
Charleston	1,700	7,130p	42 lbs. fabric	650	3,456p
Clarksburg	24,420	124,540l	......	......	......
Morgantown	24,674	112,166z	52½ lb. bars	......	......
Moundsville	......	......	......	14,800	27,000
Wisconsin					
Appleton	30,188	75,771g	41 lbs fabric	......	......
Beloit	102,000	242,511l	36 lbs. fabric	......	......
Clintonville	......	......	32 lb.	8,000	17,500
Eau Claire	30,193	61,721l	30 lbs. fabric	......	......
Green Bay	656	......	......	......	......
Janesville	103,357	222,522l	42 lbs. fabric	......	......
Kenosha	9,937	29,671f	40 lbs. fabric	......	......
Lake Geneva	10,000	23,000g	40 lbs. fabric	......	......
Manitowoc	42,000	105,000	42 lb.	......	......
Marshfield	......	......	......	2,356	1.98 s
Oshkosh	5,129	14,053a	40 lbs. fabric	......	......
Racine	65,000	151,000g	40 lbs.	......	......
Ripon	6,000	17,000l	......	......	......
Stevens Point	......	......	......	4,157	9,027
Superior	34,951	87,504a	29 lb.	......	......

A—Alley paving.

a—Entire paving job. b—Entire improvement. c—Concrete only. d—Includes grading and drainage. e—Includes curb. f—Includes grading, curb, walks, etc. g—Includes grading. h—Includes grading up to thickness of pavement. i—Includes grading, drains, catchbasins and curb. j—Includes grading, curbs, inlets, manholes, surface drainage, court costs, assessors' and attorneys' fees, engineering, inspection, etc. k—Also circumferential 5/8 inch bars and dowels. l—Includes grading and curbs. m—Laid by municipal forces. n—Includes grading, curb, incidentals, cost of collecting interest on deferred payment, etc. p—Includes grading, curbs, storm sewers, engineering etc. q—Includes engineering and administration. r—**Includes grading, curbes,** drainage and adjustments. s—Per square yard. t—Complete pavement except grading. u—Includes grading, curb, engineering, inspection and overhead charges. v—Includes grading, curb and storm sewers. w—Includes grading, curb, sidewalks, rebuilding manholes, and catchbasins, and engineering. x—Includes grading, curb and sewer connections. y—Cubic yards. z—Grading, curbs, storm inlets, engineering, interest on **payments.**

Concrete Pavements Built in 1925*

The quantities under the head "streets" were obtained by reducing the yardage to equivalent mileage of street 30 feet wide; under "alleys" to equivalent mileage of alleys 18 feet wide.

State	Miles of Streets	Miles of Alleys
Alabama	48.6	7.9
Arizona	...	2.2
Arkansas	21.5	1.7
California	316.0	19.7
Colorado	4.4	20.4
Connecticut	5.4	...
Delaware	1.3	...
Dist. of Columbia	15.5	5.7
Florida	27.6	.5
Georgia	52.1	.9
Illinois	250.0	133.0
Indiana	58.0	17.5
Iowa	62.3	7.5
Kansas	27.8	5.5
Kentucky	20.8	8.7
Louisiana	16.4	5.5
Maine	3.0	.1
Maryland	12.7	7.2
Masachusetts	15.2	.3
Michigan	81.0	53.8
Minnesota	32.0	7.8
Mississippi	10.0	.2
Missouri	84.5	18.2
Nebraska	19.9	3.3
Nevada	3.1	.1
New Hampshire	.8	.1
New Jersey	91.4	.5
New Mexico	6.9	...
New York	122.8	1.3
North Carolina	31.2	.5
North Dakota	2.2	.2
Ohio	53.7	13.7
Oklahoma	41.4	1.6
Oregon	42.7	1.5
Pennsylvania	83.8	10.6
Rhode Island	1.8	...
South Carolina	5.8	.1
South Dakota	5.8	...
Tennessee	21.0	5.5
Texas	33.4	4.2
Utah	2.4	.1
Vermont	2.2	...
Virginia	9.4	.5
Washington	96.4	7.1
West Virginia	13.5	1.7
Wisconsin	84.6	21.3
Wyoming	3.5	...
Total	1,945.9	398.2

*Information furnished by the Portland Cement Association.

Quick Hardening Cements

(*Continued from page 68*)

Oklahoma: Muskogee (as experiment), Ponca City (repairs).

Oregon: Eugene, Oregon City, Portland.

Pennsylvania: Altoona (emergency repairs), Greenville, Johnstown (200 sq. yds, of base), Meadville (patches), Monessen, Munhall, Norristown, Stroudsburg, Washington.

South Carolina: Greenville ("Cal").

Tennessee: Jackson (patches).

Vermont: Rutland, St. Albans.

Virginia: Suffolk (patches).

Washington: Everett (patches), Yakima (repairs).

Wisconsin: Beloit, Eau Claire, Green Bay (patches), Kaukauna, Lake Geneva (calcium chloride), Manitowoc, Oshkosh (repairs), So. Milwaukee, Stevens Point.

Recent Legal Decisions

VENDOR HELD LIABLE FOR COST OF PAVING ABUTTING PROPERTY SOLD

The Louisiana Supreme Court holds, O'Shee v. Chandoir, 104 So. 59, that where, at the time of execution of a promise of sale of a property the paving of the street abutting it had been completed and accepted by ordinance assessing the cost against the various property owners, the vendor of the property and not the vendee should pay the cost of the paving, since "the vendee contracted to purchase a lot of ground on a paved street."

CITY NOT LIABLE FOR INCREASED FLOW OF SURFACE WATERS FROM PAVING IMPROVEMENTS

The New York Court of Appeals holds, Fox v. City of New Rochelle, 147 N. E. 544, that, although a city may not collect surface water into a single channel and cast it in substantially increased volume on adjacent land so that the stream will be filled beyond its natural capacity and caused to overflow and flood such land, the ordinary flow of surface water will not be interfered with or limited to the natural flow as it existed before the pavement of streets and other improvements prevented the absorption of some portion of such waters by the soil; and the city cannot be required to limit the amount of surface water to be discharged into a stream to the natural flow of the stream as it existed before such paving and other improvements were made.

STREET IMPROVEMENT BASED ON INSUFFICIENTLY SIGNED PETITION ENJOINED

The Minnesota Supreme Court, in Soukop v. City of New Prague, 201 N. W. 604, enjoined an improvement where the proceeding therefor was based upon a petition not signed by the requisite percentage of abutting owners.

VOID MUNICIPAL CONTRACT FOR WHICH CITY HAS RECEIVED CONSIDERATION

Holding that a contract by a city for a design for a sewer system, entered into before an appropriation had been made therefor, was absolutely void as prohibited under Illinois Cities and Villages Act, art. 7, sections 2-4, the Illinois Supreme Court, De Kain v. City of Streator, 316 Ill. 123, 146 N. E. 550, says: "The city cannot be estopped to dispute the validity of a contract which it had no power to make for the reason that it has received the consideration. Every one is presumed to know the extent of the powers of a municipal corporation, and it cannot be estopped to aver its incapacity, which would amount to conferring power to do unauthorized acts simply because it has done them and received the consideration stipulated for."

ALLEY IMPROVEMENT ACROSS INTERSECTING STREETS A SINGLE IMPROVEMENT

The Illinois Supreme Court holds, City of Greenville v. Miller, 315 Ill. 565, 146 N. E. 465, that an ordinance for the improvement of an alley is a single and not a double improvement, although it extends through three city blocks and excepts the roadways of two intersecting streets.

EMPLOYMENT OF CONSULTING ENGINEERS NOT CONTRACT FOR CONSTRUCTION

The Massachusetts Supreme Judicial Court holds, Rollins v. City of Salem, 146 N. E. 794, that where a contract is in existence when a mayor assumes office, it is within his province to consider its terms and to ascertain the extent of the financial burdens imposed, and if found on investigation to be oppressive, or unnecessarily burdensome, to ameliorate or remove such conditions in so far as lawfully possible. The preceding administration of a city had contracted with architects to prepare specifications for an addition to a school. The mayor employed consulting engineers to pass upon the plans. It was held that he was justified in relying on their guaranty that the addition could be built at much less expense than under the original plans, and in settling with the architects and going on under new plans and specifications; and that the employment of the consulting engineers was not a contract for construction requiring advertisement for bids under the statute, but an expenditure for information and advice to enable the mayor to decide upon what action to take in the discharge of his duties.

RIGHT OF CONTRACTOR OR HIS ASSIGNEE TO COLLECT INTEREST ON DEBT FROM CITY FROM ACCEPTANCE OF WORK

A contractor entered into a contract with a city to construct a sewer, it being agreed that payment should be made upon completion of the sewer and acceptance by the city. To finance the construction of the sewer, the contractor procured funds by assignment, absolute in form, of the amount of money or bonds which would be due him from the city, which assignment was approved and accepted by the city. At the completion and acceptance of the sewer by the city, a controversy arose as to whether payment should be made in money or in bonds, with the result that payment was delayed for about eight months. In an action by the contractor to recover interest on the principal ($116,232) from the date of the acceptance of the sewer by the city, to the date of payment of the principal, the Kansas Supreme Court held, Everett v. Arkansas City, 235 Pac. 856, that it was not error for the trial court to render judgment on the pleadings against the plaintiff, where it was not alleged that the plaintiff's debt to his assignee had been fully paid and satisfied, and where it appeared that the assignee was also claiming the interest.

CONSTRUCTION OF CONTRACT WHERE EXTRA WORK PLUS ORIGINAL PRICE EXCEEDS ESTIMATE

The Oklahoma Supreme Court holds, Oklahoma City v. Derr, 235 Pac. 218, that the contractor in the performance of a municipal contract must bear the unexpected expenses arising from unforeseen difficulties incident to the performance of the work, but

he is not liable for the consequences of defects in the plans and specifications prepared and furnished by the owner. It was held that the fact that additional items, for extra work made necessary by the accidental severing of a water main, plus the original contract price, exceeded the city engineer's estimate for the work, did not constitute a defense to the contractor's action for the price, although Comp. St. 1921, §4577, provides that no municipal contract shall be entered into which exceeds the city engineer's estimate. It was also held that on showing performance of a contract with a municipality and that the debt is unpaid, the burden is on the municipality to show the illegality of the contract.

ORDINANCE AS TO OPERATION OF TRACTORS ON OILED STREETS HELD INVALID

The Iowa Supreme Court holds, Town of Randolph v. Gee, 251 N. W. 566, that a municipal ordinance, which declares it unlawful to drive a tractor or traction engine on the oiled streets of the town except when necessary to cross an oiled street to reach its destination, is invalid as violating Iowa Code 1924, §§4863-5093, which expressly declared the conditions under which tractors may or may not be operated over such streets and denies to municipalities the right to enact ordinances inconsistent with its provisions, except in certain enumerated respects.

VOID CITY CONTRACT TO BUY LAND FOR STREET DOES NOT CREATE IMPLIED CONTRACT TO PAY FOR ITS USE

The Mississippi Supreme Court holds, Edwards House Co. v. City of Jackson, 103 So. 428, that where a city's contract to purchase land for a street was void under the state statute as to incurring indebtedness, and an alternative provision to pay annually a certain amount for its use was void because no statute authorized the city to lease property for a street, the city is not liable on an implied contract for the reasonable value of the use and damages to the land from such use.

VALIDATION OF STREET PAVING BONDS

The Florida Supreme Court holds, Thompson v. Town of Frostproof, 103 So. 118, a suit by a town to validate street paving bonds, that in such a suit any question going to the power to issue and the validity or regularity of the issuance of the bonds, may be properly raised.

Bonds cannot, it is held, be legally voted to improve streets where no streets in law exist and it is not made to appear that they ever can or will exist.

WATER SYSTEM HELD PUBLIC UTILITY REQUIRING INDISCRIMINATE SERVICE

The Mississippi Supreme Court holds, Caston v. Hutson, 104 So. 698, that a water system, put down in a town before its incorporation for the accommodation and use of anybody in the town, and using the streets for its mains, though without franchise from or contract with the municipality, is so impressed with the character of a public utility that the owners and operators of the system, who fix and collect charges from consumers, must even though operating at a loss, furnish water without discrimination so long as the service to the public is continued. The right to discontinue the service entirely was not involved in the case.

ELIMINATION OF GRADE CROSSINGS IN CITIES

The Alabama Supreme Court holds, City of Birmingham v. Louisville & Nashville, 104 So. 258, that a city ordinance, authorized by Code 1923, §2070, dealing with the elimination of grade crossings in cities of more than 35,000 population, is a legislative act, and in the exercise of the police power of the city. The right to determine the wisdom, propriety and policy of legislative acts within the power of the legislative body is held to be a thing apart from the judicial function.

COUNTY AND MUNICIPALITY HELD BOTH LIABLE FOR DAMAGE FROM CHANGE OF GRADE

The Mississippi Supreme Court holds, Tishomingo County v. McConville, 104 So. 452, that under section 17 of the State Constitution of 1890, a county or municipality changing the grade of a street or road to the abutting owner's damage is liable for such damage; and where a county, in constructing a highway through a municipality with the consent of the municipal authorities, excavates and lowers the grade of a street, both the county and the municipality are liable for damage done to the abutting owner's property; the county being the actor actually doing the damage, and the municipality acquiescing in and consenting thereto, and having a duty to the abutting owners not to damage their property without first paying the compensation therefor.

RENT, DETERIORATION AND TRANSPORTATION OF STEAM SHOVEL NOT LABOR OR MATERIAL WITHIN ROAD CONTRACTOR'S BOND

The Maryland Court of Appeals holds, State v. National Surety Co., 128 Atl. 916, that the surety on a highway contractor's statutory bond is not liable for the rent which the subcontractor for the excavation work agreed but failed to pay for the use of a steam shovel, or for deterioration of the shovel during its operation on the highway or the cost of its reconveyance to the point of its delivery under the lease. The fact that a proportion of the premium on the bond was charged to the subcontractors in their account with the principal contractor was held to be immaterial.

TOWN ENGINEER HELD NOT AUTHORIZED TO BIND TOWN TO PAY FOR IMPROVEMENT

A town advertised for bids for curbing and guttering a street, the curbing to be paid for by the property owners. The contract provided that the town engineer should determine disputes between the parties. One of the owners refused to enter into the contract for the work. The engineer ordered the contractor to proceed with it, promising payment. The New Jersey Supreme Court holds, Giardini v. Mayor, etc., of Dover, 128 Atl. 798, that the engineer was not authorized to bind the town to pay for the work.